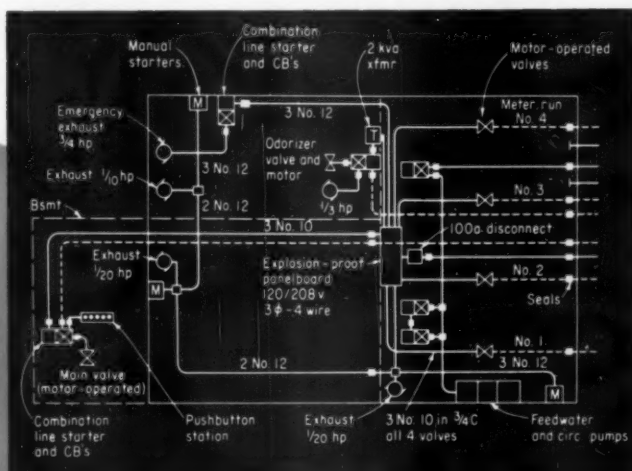


APRIL
1959

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ELECTRICAL CONSTRUCTION AND MAINTENANCE

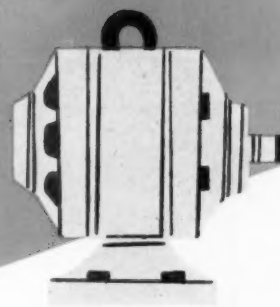
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GATE STATION wiring and control, electrical details of a modern hazardous area installation.

LIGHT AND ARCHITECTURE — A leading industrial designer reviews the changing needs in lighting application.

MOTOR SHOPS — A pictorial roundup of Montreal establishments, hosts to the NISA Convention, May 17-20.



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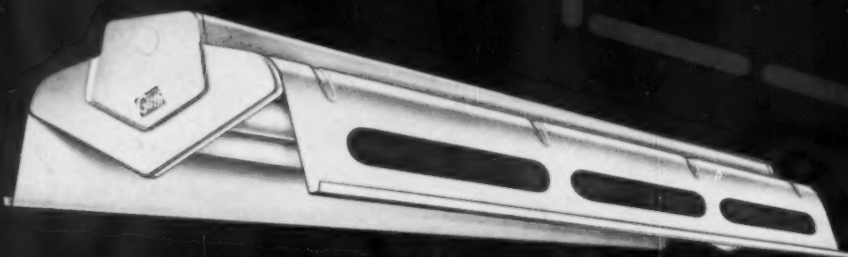
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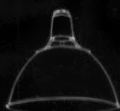
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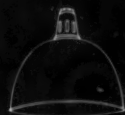
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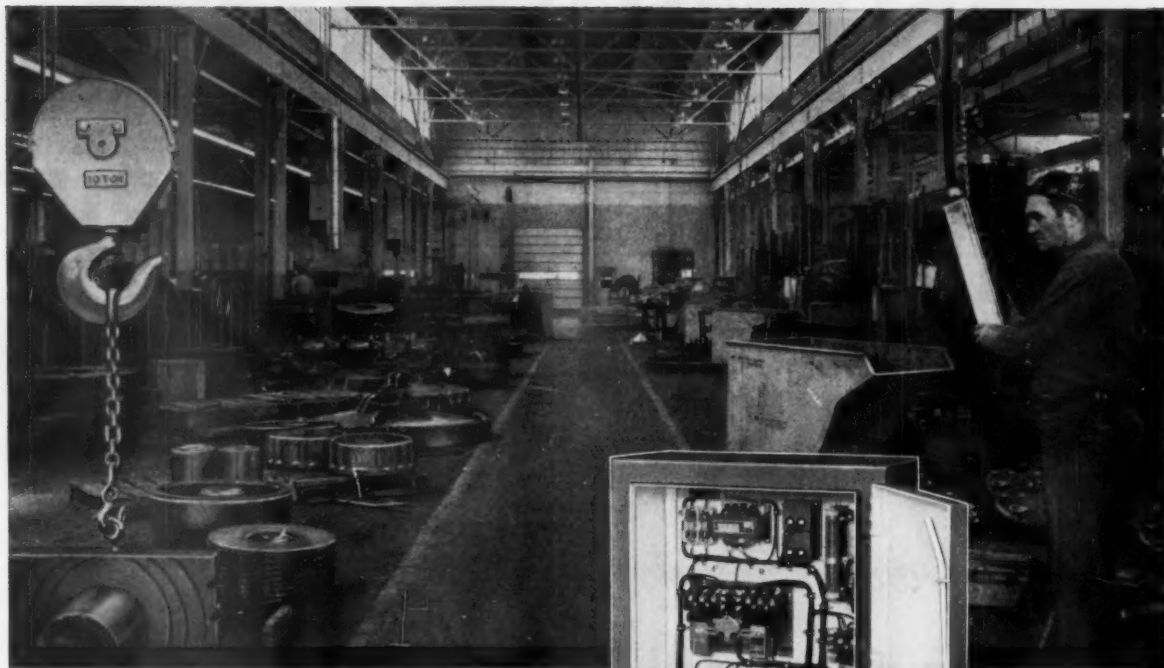
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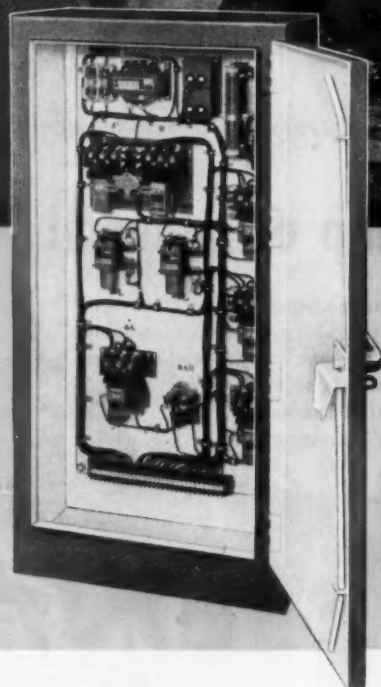
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2,749,435 2,715,214
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Modernization of Senate Chambers in Connecticut State Capitol included installation of lensed downlights in overhead bay.	

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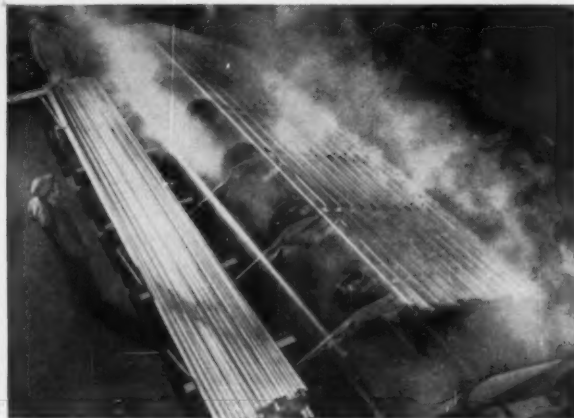
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Residential Outdoor Lighting 104
 By CLINT SIGLER—Home owners are spending a few billion dollars annually on outdoor living, but only a small fraction of this is spent on outdoor residential lighting systems and equipment.

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ELECTRICAL CONSTRUCTION and MAINTENANCE

April 1959

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Washington Report

APRIL • 1959

February construction spending totaled \$3.5 billion, 12% above the \$3.1 billion for February 1958, Commerce & Labor Depts. reported, a new high for the month. The rise was attributed primarily to housing, up 30% for the first two months of this year over similar period a year earlier, to \$2.2 billion. Spending for private industrial plants for January and February dropped to \$167 million, 35% below same two months last year.

Housing starts in February totaled 89,000, for a seasonally-adjusted annual rate of 1,320,000, BLS reported. Public housing starts totaled only 1100 units. The February total compares with 86,000 starts in January, and 66,100 in February, 1958. Private housing starts for the two months totaled 171,200, or 38% more than the 123,900 for the like period of 1958.

There's a strong demand for homes, especially in the lower price range, according to latest consumer survey made by Federal Reserve Board—about equal to demand in 1955, which was a big homebuilding year. And builders generally see a good year ahead.

In spite of this optimistic homebuilding outlook, both House and Senate have passed housing bills providing government aid for housing on the theory that the building industry needs an artificial stimulus.

Consumer spending plans reflect increased interest in housing, and optimism on earning prospects and business conditions, but do not add up to a boom year for sales of new cars and other "big ticket" items, according to survey recently completed by Federal Reserve Board and survey research center of University of Michigan. Some 9.3% of consumers interviewed said they planned to buy homes in 1959, against only 7.5% in 1958. Also, 24.6% reported plans to spend money on home improvements, compared with 22.1% last year.

The Government's outlay on farm surplus crops (wheat, cotton, corn, tobacco, etc.) will total \$9.1 billion by June 30 (end of fiscal year 1959), according to Agriculture Secretary Ezra Benson. It is interesting to note this is approximately double the entire electrical construction and installation dollar volume for both new construction and modernization of \$4.78 billion forecast by EC&M (January, p. 67) for 1959.

Congressional proposals for a national "fair trade" law are vigorously opposed by the Federal Trade Commission as "inconsistent with the American system of free enterprise and contrary to public policy expressed by Congress in antitrust laws since 1890", and by the Dept. of Justice on the basis that the law's constitutionality would be in doubt. Strong backer of proposed legislation is National Assn. of Retail Druggists. Opponents include the Administration, organized labor, consumer groups, some big manufacturers and department stores.

Nation's output of electricity is running ahead of similar period a year ago by an average of 7.5% to 10%. All geographic areas show gains, with Pacific Northwest and central industrial regions showing greatest increases during February-March period.

Most economic barometers continue to rise and, for the economy as a whole, indicate that 1959 will be the best year in history. With the exception of employment, most sectors of the economy have reached pre-recession peaks.

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Sidelights

NISA CONVENTION

The National Industrial Service Association convention is scheduled for May 17-20 in Montreal, Quebec, Canada. As a preview of what delegates will see in their shop tours, we present, beginning on page 76, a pictorial roundup of the operation and shop equipment typical of the service shops in the Montreal area.

ELECTRIC HEAT FOR MODERNIZATION

While electric heating is now widely applied in new homes, what about home modernization? A New Jersey electrical contractor installed a new electric heating system in his own home under severe heat loss conditions and in an area where residential rates for electric heating are relatively high. The results indicated electric heat to be both desirable and reasonable in cost for modernizing existing homes. The installation and operating details are discussed in "Case Study in Electric Home Heating Modernization" beginning on page 88.

OUTDOOR LIGHTING

People spend several billions of dollars annually for all kinds of furniture and gadgets for outdoor living in the summer. But the market for outdoor lighting, both functional and decorative, has hardly been scratched. Clint Sigler of BDSA discusses the opportunity in a article based upon Department of Commerce studies, "Residential Outdoor Lighting", on page 104.

ELECTRONIC CONTROL

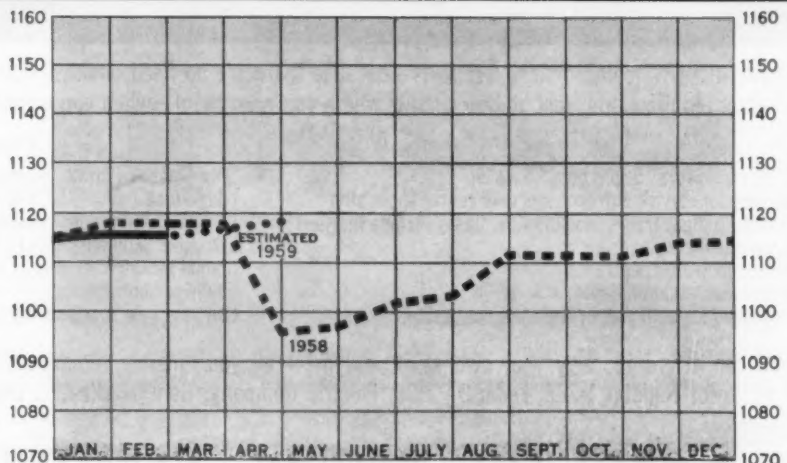
Complete operation of a natural gas gate station from the main utility offices ten miles away over a single pair of telephone wires by means of electronic tone transmitters and receivers has reduced attendant supervision to an occasional routine maintenance call. This valve control and metering installation, incorporating extensive Class 1 Div. 1 wiring, is described in "Gate Station Control" beginning on page 90.

LIGHTING DESIGN

Today's most important trend in lighting system design is to consider light as a design element, and lighting equipment as a design tool. This concept, used intelligently, greatly broadens the scope of lighting application practice. It calls for increased cooperation between the architect and the lighting engineer. This trend, and the challenge it presents to the lighting industry, is discussed authoritatively by Peter Muller-Munk, an industrial designer, who has studied the subject in detail, in his article "Light and Architecture", which begins on page 83.

ELECTRICAL MATERIALS COST INDEX

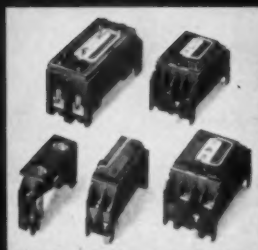
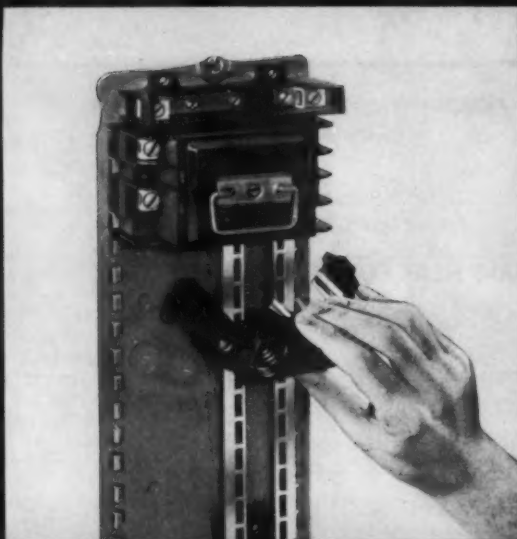
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Depreciation Reform— Why Industry Needs A Modern Tax Policy

A shockingly large proportion of our industrial plant and equipment is obsolete. As indicated by an earlier editorial in this series, over \$95 billion would have to be spent—and spent soon—to bring our industrial facilities up to the best modern standards. Yet plans for 1959 call for little more than \$30 billion of actual spending—barely enough to make a start on this backlog of modernization.

At the heart of the problem of obsolescence is a federal tax policy that discourages business from replacing inefficient facilities. It is the purpose of this editorial to spell out a tax reform Congress can make this year—with little cost in terms of tax revenue—that would go a long way toward removing the barrier to modernization of plant and equipment. This reform is a more realistic system of tax deductions for depreciation and obsolescence of productive facilities.

A Barrier to Modernization

Industry abounds with examples of old and obsolete facilities—despite large expenditures made in the past few years. Two-thirds of our metalworking equipment is over ten years old. Over half the capacity of our chemical process industries was installed before December 1950. Only a minor fraction of our railroad freight moves in new freight cars or the new push-button freight yards.

The tax law bears a large part of the responsibility for this lag in modernization because of its important influence on business investment in plant and equipment. For many years the tax law has permitted as a deduction from income “a reasonable allowance” for wear and tear and obsolescence of productive facilities. These annual deductions affect business investment in several ways.

- They are the way a company recovers its investment in plant and equipment.
- They determine in large measure, the amounts of money that are spent each year to replace and modernize facilities.
- Furthermore, the schedule for depreciation often determines **when** a specific machine or building is actually replaced.

The law requires that depreciation deductions be spread over the “useful life” of a building or machine. But the periods of useful life for tax purposes today still depend heavily upon tables drawn up by the Treasury almost 20 years ago. These tables reflect the replacement practices of depression years. Also, they were compiled at a time when the pace of technological progress in industry was much slower than it is now. **For nearly all types of equipment the indicated period of useful life is longer—sometimes much longer—than most experts consider realistic at today’s rate of technological advance.**

The result of these outmoded depreciation schedules is that the recovery of investment is dragged out, and the replacement of obsolete equipment is delayed.

In The Right Direction

Congress should establish, by law, the right to use shorter depreciation periods on productive equipment. It should do so in a way that would free industry from obsolete concepts of the rate of technological change and would provide incentives to install new equipment and produce new products.

The tax reform act of 1954 made some progress in this direction—but not enough. It introduced new methods for calculating depreciation—the declining balance and the sum-of-the-years' digits—which enable a business to recover most of the investment in a new facility in the early years of its useful life. However, these new methods do not accomplish their desired purpose when the supposed "useful life" is still an unrealistically long period of years.

Industry is by no means free from blame for the failure to bring depreciation policy into line with the needs of a modern, growing economy. According to Joel Barlow, president of the Tax Institute, "management has largely ignored the Commissioner's invitation . . . to come into the Internal Revenue Service office and make a case for shorter depreciable lives by establishing technological obsolescence."

The failure of many companies to see their own interest in more realistic depreciation not only holds them back from modernizing their own facilities but also lends support to the Treasury in its continued adherence to an out-dated policy.

A Suggestion For Reform

An excellent model for reform of the depreciation policy in our tax law is the system used successfully in Canada for a decade. In Canada, all productive equipment may be depreciated at relatively fast rates assigned to each of 14 broad categories. The Canadian system permits depreciation up to twice as fast as the antiquated tables of useful

lives now followed in the U. S. It also gives the individual business far greater flexibility in determining depreciation schedules that fit its own needs and experience.

For example, in the category or "bracket" covering general machinery a taxpayer in Canada may depreciate up to 20% of the machine's value annually, on a declining balance basis. In the U. S. the fastest rate at which many types of machinery can be depreciated is only 10%. In other categories, from tools and dies to buildings and pipelines, the Canadian system also allows faster depreciation and provides greater incentive to invest in new facilities.

The cost of this reform in terms of lower tax revenue would be small—probably less than \$500 million in the first year. And even this would merely be postponed, not permanently lost. Indeed, there is a very good prospect that tax revenue would not suffer at all. The increase in spending for new plant and equipment resulting from this tax reform would mean an increase in wages and profits—and therefore in taxes—in industries that produce machinery and other capital goods.

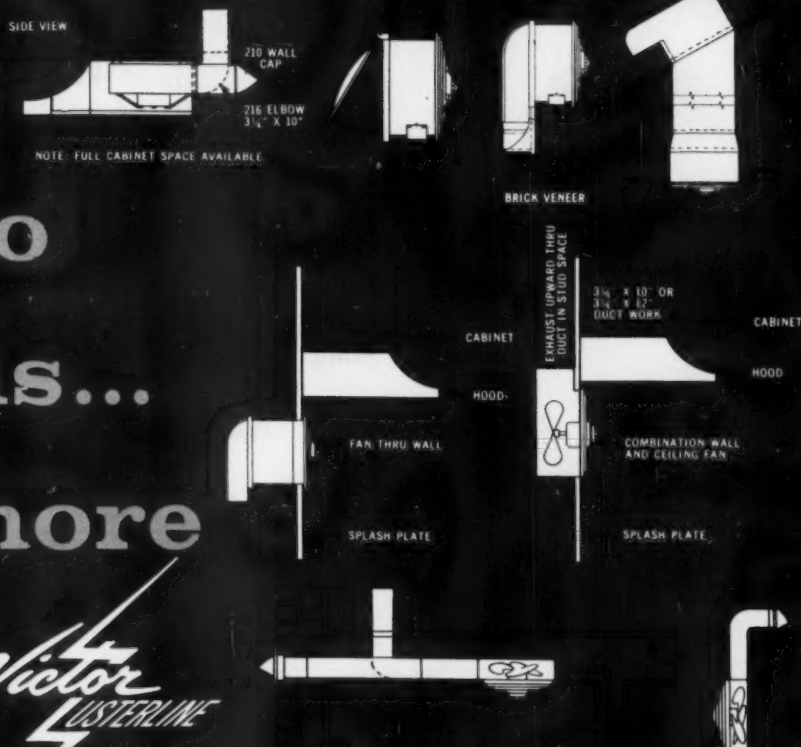
A realistic tax policy on depreciation would provide a badly needed incentive for industry to replace obsolete and inefficient facilities with up-to-date plants and equipment. It would step up our rate of technical advance and economic progress. And it would put U. S. industry in better shape to meet the growing competition from other countries that have grasped the advantages of fully modern technology.

This message was prepared by the McGraw-Hill Department of Economics as part of our company-wide effort to report on opportunities for modernization in industry. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or part of the text.

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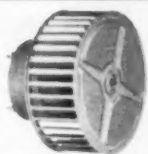
carry a five-year guarantee. All products are backed by the Victor \$30,000,000 Warranty.

This is the fan and hood line the whole industry is copying. BONDERIZED range hoods are exclusive with Victor; Bonderizing is your guarantee of lasting fine appearance—your assurance of maximum protection against corrosion due to moisture and grease.

There's every opportunity for you to profit from the adoption of Victor Lusterline Range Hoods and Fans as standard. Why not send for a catalog and see for yourself?



Interior of hood without baffle plate



Impeller type blower



Interior of hood without baffle plate



Propeller type fan

Victor Ventilator Division
The Philip Carey Mfg. Company
Middletown, Ohio

Please send me a copy of your Fan and Hood Catalog.

Name

Title

Address

City & State



"Telephone planning helped us sell over 2500 homes!"

—says Robert C. Gordon, Ashdon Corporation,
San Diego, California

"Planning for the future telephone needs of our home buyers has always made good sense to us," says Bob Gordon. "In fact, we've offered concealed telephone wiring in every one of the more than 2500 homes we've built since 1949.

"It makes sense to prospects, too. They like the idea of telephone wiring neatly concealed inside the walls. And they like having outlets throughout the house, so they can expand their phone service as they need to. No doubt about it—it's a built-in 'extra' that really helps us sell our homes."

Mr. Gordon's corporation is currently building Coronado Estates, a community of 85 beautiful homes in the \$24,000 to \$45,000 price range located on the Silver Strand peninsula offshore from San Diego. Each home is telephone planned, and this fact is featured prominently in the builder's local advertising.

Your local Telephone Business Office will gladly help you with telephone planning for your homes. For details on home telephone installations, see Sweet's Light Construction File, 8i/Be. For commercial installations, Sweet's Architectural File, 32a/Be.

BELL TELEPHONE SYSTEM



This is one of the Coronado Estates homes, being built by Ashdon Corporation in the San Diego area.



REG. U.S. PAT. OFF.
SCOTCHLOK BRAND
Electrical Spring Connectors
 give tons of holding power...



"SCOTCHLOK" Brand Connectors are the tightest gripping electrical wire connectors you can use—actually 50,000 psi of *permanent* holding power. They won't come loose or fall off! For all their strength, they are also compact, easily and quickly applied. Completely pre-insulated with unbreakable vinyl . . . long conforming skirt protects wire, prevents flash-over. You *know* the splice is tight because it *feels* right! Three sizes, each color-coded, enable you to pick the right connector quickly.

REG. U.S. PAT. OFF.
SCOTCHLOK BRAND
Electrical Spring Connectors

TYPE "Y" (Yellow) for fixtures: No. 12 to 18 AWG solid and stranded. **TYPE "R"** (Red) for general circuits: No. 10 to 16 AWG, solid and stranded. **TYPE "B"** (Blue) for heavy-duty industrial: No. 6 to 12 AWG, solid and stranded.

Send for FREE SAMPLES!

Tons of holding power in a fraction of an ounce!

See for yourself how tight the grip—how permanent the holding power! For samples of all three sizes, just write on your letterhead to 3M Co., 900 Bush Ave., St. Paul 6, Minn., Dept. CB-49.

Made by the makers of "SCOTCH"
 Brand No. 33 Electrical Tape

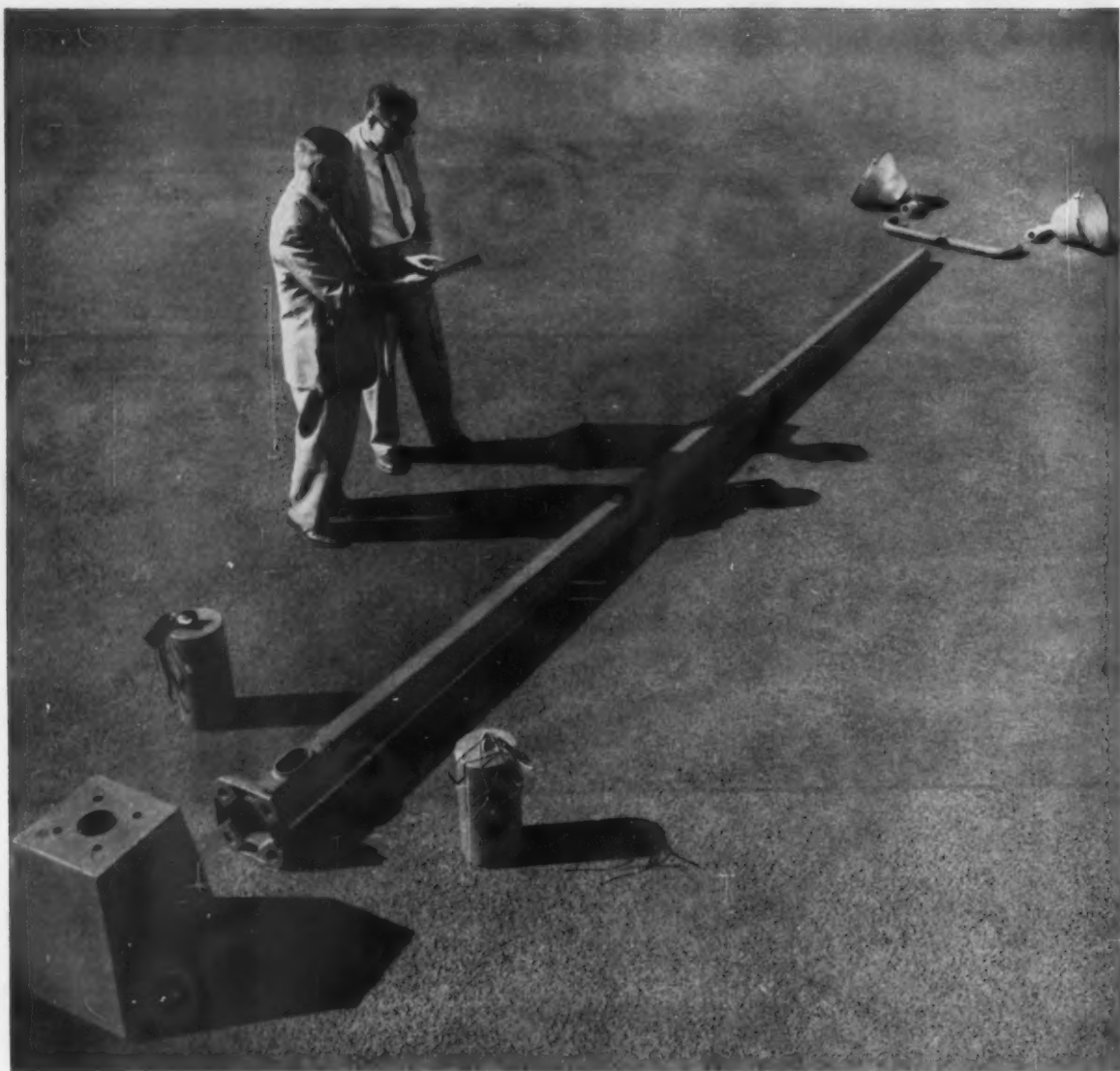


"SCOTCHLOK" AND "SCOTCH" ARE REGISTERED TRADEMARKS OF 3M CO., ST. PAUL 6, MINN. EXPORT: 99 PARK AVE., NEW YORK 16, CANADA; LONDON, ONTARIO.

MINNESOTA MINING AND MANUFACTURING COMPANY
 . . . WHERE RESEARCH IS THE KEY TO TOMORROW



ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . APRIL, 1959



Revere's complete line of matched equipment means peak efficiency and easy installation

Shown above are the components of a Revere outdoor lighting installation. Every component — pole, base, bracket, lights — is *perfectly matched* to every other component, so the completed installation is *exactly right* for the job. Components "fit" right to make installation easy, they are structurally matched for strength and balance, and "design-matched" to give peak lighting efficiency for the application.

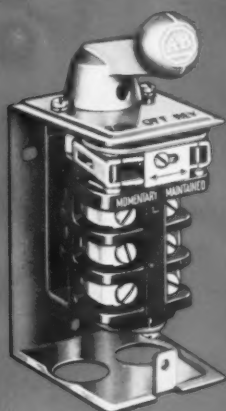
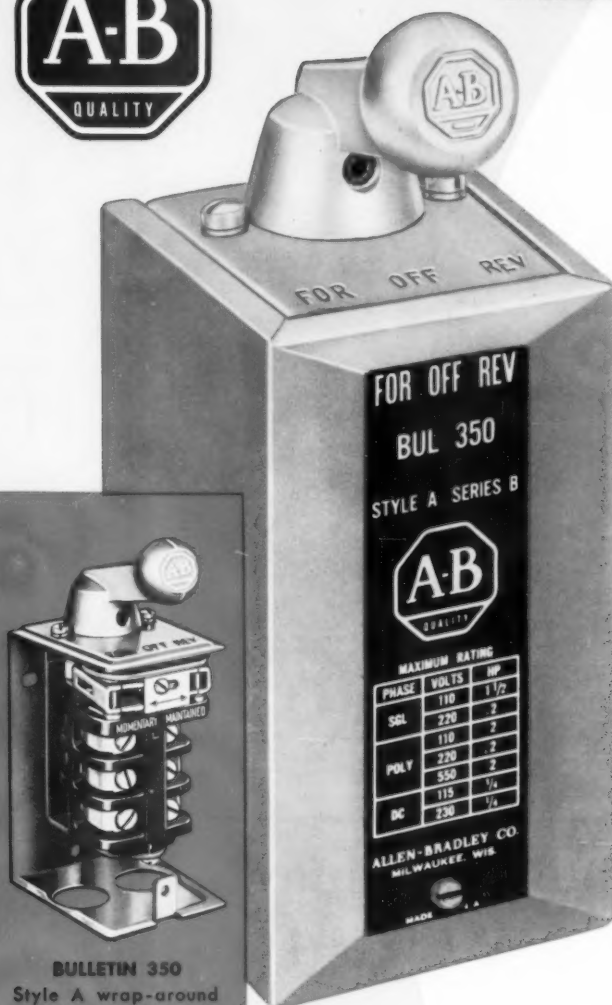
Revere offers the widest selection of outdoor lighting equipment available from any single source. You can get on-time delivery of Revere fixtures for incandescent, mercury or fluorescent lighting, as well as hinged, rigid, separable poles and accessories. Ask your wholesaler about the advantages of specifying Revere equipment.

Write for catalog of Revere's complete line of matched outdoor lighting equipment.

Revere. OUTDOOR LIGHTING
 Revere Electric Mfg. Co. • 7420 Lehigh Avenue • Chicago 48, Illinois (in suburban Niles)
 Long Distance Phone: Niles 7-6060 • Chicago Phone: SPring 4-1200 • Telegrams: WUX Niles

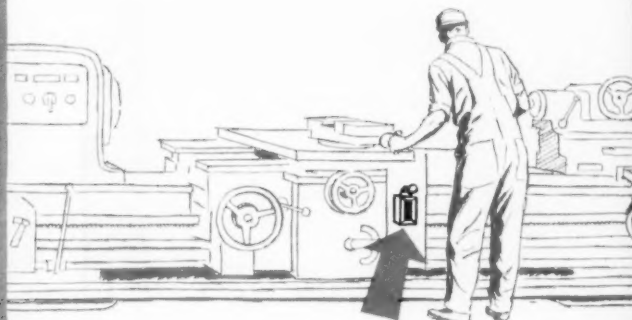


ALLEN-BRADLEY REVERSING DRUM SWITCHES



BULLETIN 350

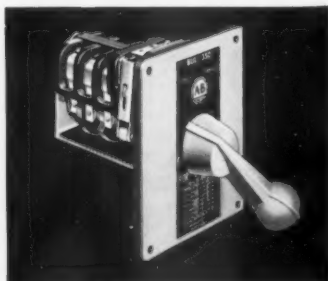
Style A wrap-around cover is removed to show the readily accessible front wiring terminals. Max rating: 2 hp.



...styled to match the most modern production machines!

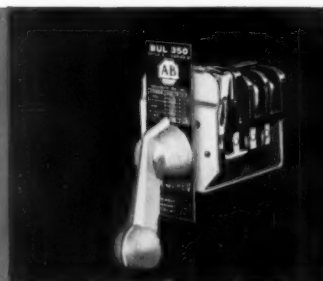
Inside and out—this Allen-Bradley drum switch is *all* new. Its trim, modern lines and attractive die-cast aluminum handle will give your production machines "up-to-the-minute" styling.

But there is more than beauty to this new switch. The rugged switch mechanism is a self-contained unit—independent of the enclosure. Misalignment and binding *cannot* occur. The base mounts directly on machine surfaces—without using spacers. And with the wrap-around cover removed, terminal screws are exposed for fast wiring—from the front. Changeover from momentary to maintained contact operation can be made in seconds. Investigate this new "leader" in its field. Send for Publication 6091.



OILTIGHT CAVITY MOUNTING

A-B Style AF reversing switches can be furnished with sealed shaft and rubber-gasketed, oiltight cover for cavity mounting in a machine base.



PANEL MOUNTING

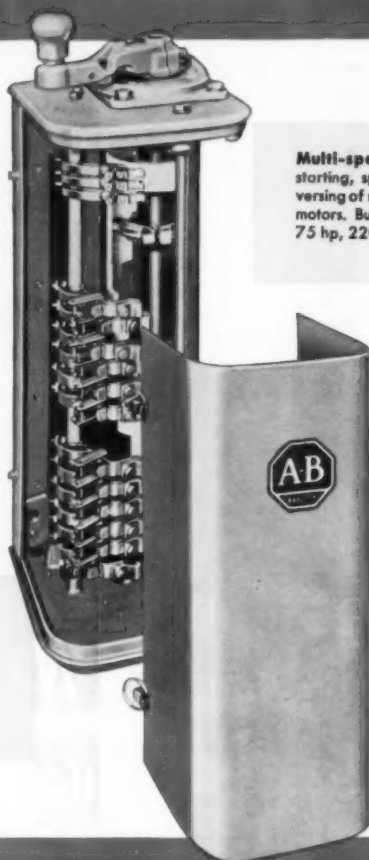
The new Style A switches can be furnished for mounting directly on panels. Nameplate which gives ratings is also included with each switch.

ALLEN-BRADLEY

Quality Motor Control Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.



Reversing Drum Switch for across-the-line starting and reversing a-c and d-c motors. Interlocks available. Bulletin 350. Max ratings: A.C. 20 hp, 220v; 40 hp, 440-550v. D.C. 3 hp, 115-230v.



Multi-speed Drum Switch for starting, speed changing, and reversing of multi-speed squirrel cage motors. Bulletin 365. Max ratings: 75 hp, 220 v; 150 hp, 440-550 v.



Speed Regulating Drum Switch for starting and regulating duty of wound-rotor motors. Bulletin 375 non-reversing. Max ratings: 500 hp, 220-440-550 v. Bulletin 385 reversing. Max ratings: 60 hp, 220 v; 75 hp, 440-550 v.



For years of dependable performance **ALLEN-BRADLEY DRUM SWITCHES** have no equal!

These Allen-Bradley drum switches provide simple and economical control for alternating current motors. Although low in cost, these unusually rugged switches are built under Allen-Bradley standards of *quality* . . . your assurance of reliable, trouble free performance. And this broad line of drum switches offers a variety of mounting types, operating handles, and interlocks to satisfy practically every requirement. Let us send you details on this versatile line of drum switches.

ALLEN-BRADLEY

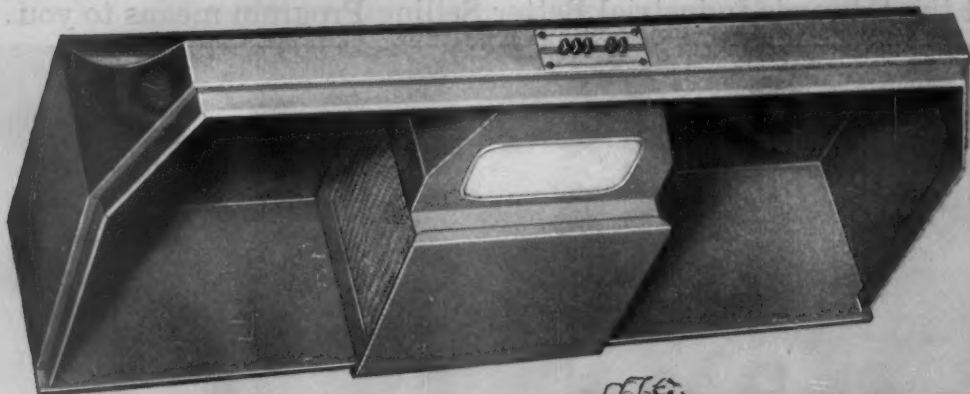
Quality Motor Control

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

3-59-MR



What the Edwards Industrial Better Selling Program means to you . . .



**Installs in half the time
of ordinary range hoods**

NEW *Broan*

Dual Blower Hood

a fully integrated package

There is more of everything for everybody in this NEW Broan Hood. The housewife gets a better performing installation — the extra power of a dual blower. The contractor gets more to "sell" — at a better price. For example, the hood and blower are factory prewired and are put in place as a single unit. Many contractors report their installation time is only half of

their former experience. That difference can mean many more successful jobs for you.

Get the full facts on this BEST ENGINEERED hood today. See your distributor, or write for full information.

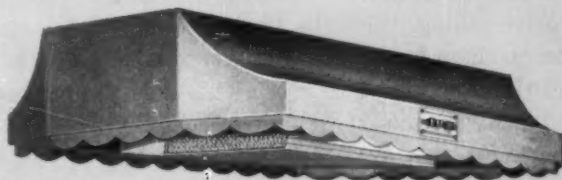
***Broan* MANUFACTURING COMPANY, INC.**

948 West State St., Hartford, Wisconsin | Near Milwaukee

Specialists in Quality Ventilating Equipment for More than 25 Years.

Additional Features—

- Vertical or horizontal discharge directly into 3 1/4" x 10" standard duct.
- Built-in spring-loaded backdraft damper.
- Blower removable without tools. Two lifetime aluminum filters.
- Brilliant illumination — ribbed crystal lens.
- Seamless welded construction — no grease-catching trim strips or rivets.
- Saves cabinet space — self contained.
- "Contour-corner" design — out of the way of cabinet doors.
- Modern or colonial styling, five widths, stainless steel or colors.



Dual-Blower Island Hood

The Broan Island Hood is completely self contained, offers fast, economical installation plus dual-blower power. Combines all the engineering advances and features of the regular Dual-Blower Hood. Choice of styles, widths, finishes.

What the Edwards Industrial Better Selling Program means to you...

BOB KEMPTON,
Director of Marketing,
Edwards Company, Inc.



"The vast industrial signaling market —New Business for You!"

"The industrial market has long offered a real opportunity to the alert contractor ready to do some creative selling. With the 1959 Edwards Industrial Better Selling Program now under way, there is an excellent opportunity for you to team up with your local Edwards distributor and take advantage of this special sales effort. This program has been carefully developed to sell Edwards systems to the industrial market. Its sole purpose is to *create business*—and it will...for both the distributor and *you*."

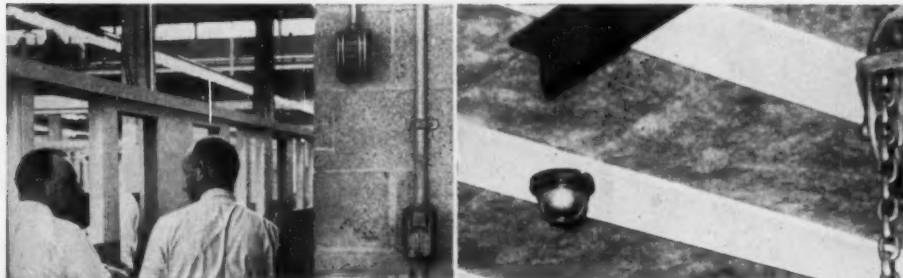
Briefly, here's how it works... The Edwards distributor will be making more calls on industrial plants. He will use specially developed material to gather information on each plant's signaling requirements. Next he will prepare and submit the suggested signaling equipment that will best solve the prospect's problems. *HERE'S WHERE YOU COME IN:* He then will present a specific proposal and quotation. Since Edwards recommends the recognized electrical contractor as the installer of its equipment, why not be there at the quotation stage! (And remember, the Edwards Technical Representative is always available to help you prepare quotes for the more elaborate jobs.)

Let this "Silent Salesman"

This market is a big one, and a lucrative one—especially now with the emphasis on plant modernization programs.

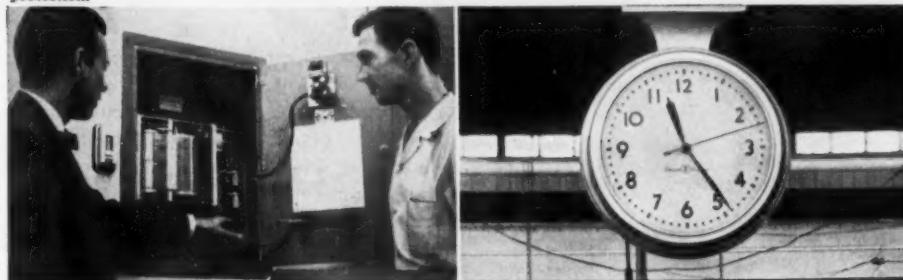
As proof that we're talking about more than just bells and buzzers, here are some of the extensive systems that this program will help you sell.

FIRE ALARM SYSTEMS



Strategically located manual coded stations combined with ceiling-mounted automatic fire detectors provide 24 hour protection.

CLOCK and PROGRAM SYSTEMS



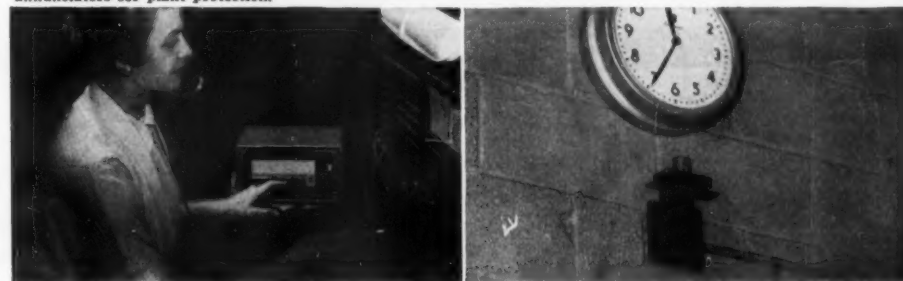
With an Edwards Program unit plant personnel can change program schedules in seconds. Double-faced suspended clock provides large area plant visibility.

ANNUNCIATOR SYSTEMS



Among Edwards complete line of industrial annunciators: remote reset annunciators for power plant control, sprinkler annunciators for plant protection.

PAGING SYSTEMS



Edwards LOKATOR master selector unit can control many paging signals such as industrial chime shown below Edwards clock.

This Industrial Program is an extension of the overall Edwards Better Selling campaign. We're enthusiastic about its potential in this vast market. When you get the details, we're sure you'll be enthusiastic, too. Why not take advantage of this business-making opportunity and plan your sales alliance now. Write Edwards for the name of your local participating distributor.

EDWARDS

Specialists in signaling since 1872

CONTROL • COMMUNICATION • PROTECTION
Edwards Company, Inc., Norwalk, Conn.
(In Canada: Edwards of Canada, Ltd, Owen Sound, Ontario)



**SPECIFICATION
GRADE**

Let this "Silent Salesman" help you get more jobs

CIRCLE F NO-KLIK® QUIET SWITCH

Circle F NO-KLIK Quiet Switches clinch many a job for the electrical contractor. It's amazing what an enthusiastic response you can get merely by handing one to a prospective customer and letting him flick it on and off a few times. Everybody wants it, once they discover what a contrast there is between its quiet, smooth operation and the sharp click of the ordinary switch.

The NO-KLIK Switch is a natural for bedrooms, nurseries, libraries, hospitals, offices, hotels—wherever quiet is desirable. Many home-owners want them for all rooms. Let Circle F NO-KLIK Quiet Switches help you land more jobs—and satisfied customers. See your distributor, or write us direct.

Simple, compact mechanical design — no mercury or fluids

Exploded view shows simplified construction . . . silver contacts for smooth, reliable, lifetime switching action . . . operates in any position . . . totally enclosed mechanism has 8 binding screws to take wire up to No. 10.

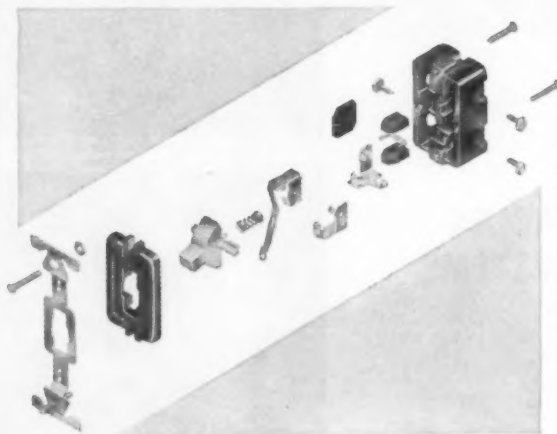
15 Amp., 120 Volts,
A-C only ☐
15 Amp., 120-277 Volts,
A-C only

#3401 S.P. Brown
#3401-I S.P. Ivory
#3402 D.P. Brown
#3402-I D.P. Ivory
#3403 3-way Brown
#3403-I 3-way Ivory
#3404 4-way Brown
#3404-I 4-way Ivory

20 Amp., 120 Volts,
A-C only ☐
20 Amp., 120-277 Volts,
A-C only

#3421 S.P. Brown
#3421-I S.P. Ivory
#3422 D.P. Brown
#3422-I D.P. Ivory
#3423 3-way Brown
#3423-I 3-way Ivory
#3424 4-way Brown
#3424-I 4-way Ivory

Approved for control of Fluorescent Lamps on A-C circuits of 277 Volts and less and for motor loads up to 277 Volts at 80% of current rating of the switch.




Circle F Mfg. Co.

TRENTON 4, NEW JERSEY

IN CANADA: VERD-A-RAY ELECTRIC PRODUCTS LTD., MONTREAL 9.

For your wire requirements: Eastern Insulated Wire Corp. (A Subsidiary), Box 591, Trenton, N. J.





*Excitingly new lighting possibilities
are open to the architect, engineer
and contractor with Sunbeam Lighting
Company's circular recessed
Visionaire® Series #CSP3800.*

DECORATIVE CONTRASTS ARE YOURS WITH CIRCULAR VISIONAIRES®



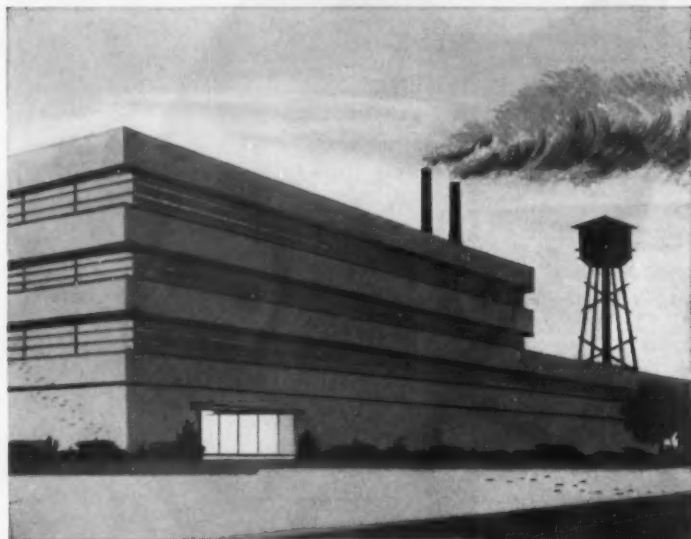
From Massachusetts to California you can see many installations of these contemporary circular Sunbeam Lighting Company Visionaires. Dramatic effects are obtainable by installing these units in various sizes in random patterns. Nominal 2-ft, 3-ft and 4-ft diameters, the CSP3800 Series, as "large area" sources, produce high level, low brightness illumination. They take standard fluorescent lamps. The domed translucent white Plexiglas diffuser opening on concealed hinges, has long-life characteristics assuring minimum maintenance. The smart, circular trim fits flush to the ceiling and the recessed enclosure is square in shape permitting standard installation methods. Write today for bulletin #D51.

SUNBEAM LIGHTING COMPANY

777 East 14th Pl., Los Angeles 21, Calif.
3840 Georgia St., Gary, Ind.

TREMENDOUS MARKETS

for Exide Lightguard emergency lighting units



Industrial

Easy to sell

Every factory *needs* protection against sudden darkness. If lights go out, they risk heavy losses . . . from injury, panic, equipment damage. Exide Lightguard® units give complete protection. Most customers buy several. Profits for you are substantial. Try it and see.

Commercial

Untapped potential

Stores and restaurants, offices and theaters need light in key areas all the time. Sudden darkness gives thieves a field day. Sudden darkness gives thieves a field day. Crowds panic. Yet the fact is most businesses still don't have emergency lighting. Be first to profit. Tell them the Exide Lightguard story.



Easy to install. Completely self-contained. Exide Lightguard units plug into regular power outlets. Go on automatically if power fails. Flood large areas with light. Only Exide Lightguard offers the extra safety of genuine Exide batteries and built-in charger. Better protection. Less cost per year. For information on becoming an Exide Lightguard dealer, write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Exide®

*the beauty . . .
the design . . .
the performance . . .
you've hoped for in one switch—*



PUSH - IT



PRESS - IT



ROLL - IT



ROCK - IT

*Push It, Press It,
Roll It, Rock It*

No matter how you choose to operate the new **ROCKER-GLO**, the merest brush of a finger produces instant action . . . and **ROCKER-GLO** glows in the dark! The switch that looks right, feels right and is right for every type of wiring job.



the new



ROCKER-GLO SWITCH

After intensive testing, Pass & Seymour proudly presents **ROCKER-GLO** . . . the one switch that answers all your needs.

A switch that is trouble-free and packed with eye-appeal.

ROCKER-GLO does the job of all types of switches. It combines toggle action and press action with luminous and quiet features that answer all individual customer needs.

You can tell when it's on or off.

Rocker-Glo — The Specification Grade Switch

AVAILABLE in Despard interchangeable type, Despard type mounted on strap and narrow rocker for tumbler switch plates. A specification grade switch, 15 and 20 amps. 120/277 volts A.C.

Send for brochure on Rocker-Glo Dept. ECM-459



PASS & SEYMOUR, INC.

SYRACUSE 9, NEW YORK

60 E. 42nd St., New York 17, N.Y. 1440 N. Pulaski Rd., Chicago 51, Ill.
In Canada; Renfrew Electric Limited, Renfrew, Ontario

STANDARD TYPES

Power Cables (600-5000 Volts) single and multiple conductor — braided, interlocked armored or with lead sheath. Lighting Wires, Motor Lead Wires, Control Cables.

Power Cables (600 & 5000 Volts) single and multiple conductor — braided, interlocked armored or with lead sheath.

Power, rheostat, apparatus cables solid, stranded, flexible and extra flexible. 600 and 300 Volts.

APPLICATIONS

Recommended for severe operating conditions in high ambient locations. For wet locations specify this construction with lead sheath. N.E.C. Type AVL.

For details ask for catalog 10G and the AVA Manual (RMI 657).

Recommended for secondary leads from power centers to bus ducts in armored construction. For wet locations specify lead sheath type VL or impervious sheathed armored cables.

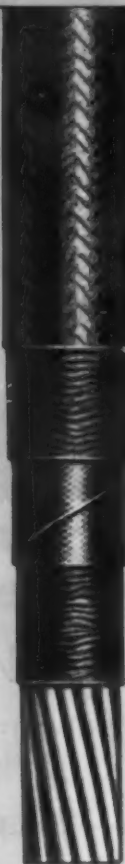
For details ask for catalog VC56.

Recommended for wiring in high ambient, dry locations as outlined in National Electrical Code.

For details, ask for catalog AW55.

For Use In:

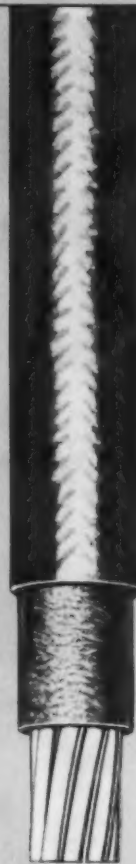
Aircraft
Appliances
Switchboards
Electric Motors
Lighting Fixtures
Mining Machinery
Electronic Devices
Electrical Apparatus
Railroad Locomotives
Automotive Plants
Industrial Plants
Food Industries
Power Stations
Glass Factories
Pottery Plants
Boiler Rooms
Steel Mills
Refineries



Max. Operating Temperature
230°F (110°C)
Rockbestos A.V.C. — N.E.C.
Type AVA — asbestos, var-
nished cambric insulated



Max. Operating Temperature
185°F (85°C)
Rockbestos Varnished Cam-
bric — N.E.C. Type ACV, V



Max. Operating Temperature
257°F (125°C) AIA 392°F
(200°C) AA, A
Rockbestos All-Asbestos In-
sulated — N.E.C. Type A, AI,
AA and AIA

MODERNIZE
WIRE-WISE

**ASBESTOS VARNISHED CAMBRIC-VARNISHED
ROCKBESTOS PRODUCTS CORP**

*Teflon-duPont Reg. TM for "tetrafluoroethylene" resin

PNR Control Cables 600 Volts.

Other thermoplastic control cables
600 & 1000 Volts.

Machine Tools and Appliance Wires.

Rockbestos PNR — small diameter —
saves conduit space. These Rockbestos
control cables are recommended for
use in conduit, direct burial or exposed
overhead applications. Recommended
for station control cable circuits.

Combinations of polyethylene and PVC
to IPCEA Standards 600 & 1000 Volts.
For details, ask for catalog CC-58.

Power Cables 600 & 5000 Volts.
Control Cables, Class H Motor
Lead Wire, Heating Cable, De-
froster Wire, Appliance and Fix-
ture Wire.

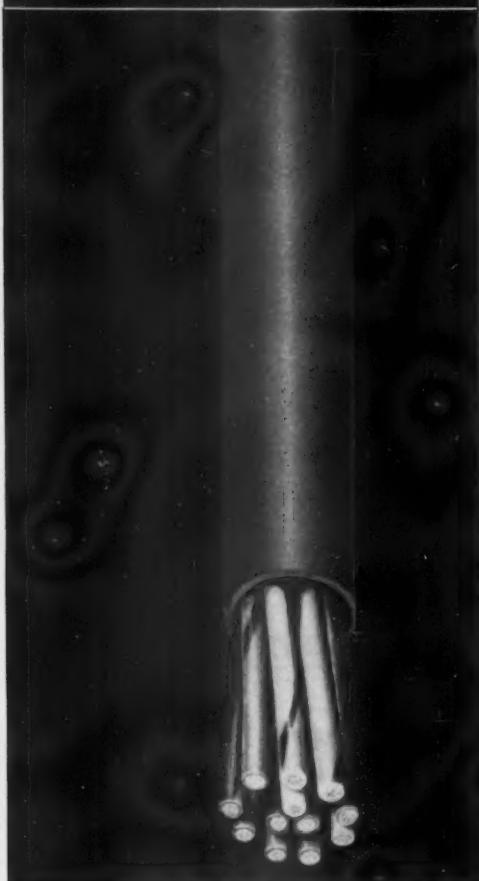
Unrestricted in application — use
in wet or dry locations in high am-
bient operating temperatures.
Silicone rubber eliminates neces-
sity for lead sheath.

For details, ask for catalog SR-58.

Switchboard wires, hinge cable,
bus cable (600 Volts).

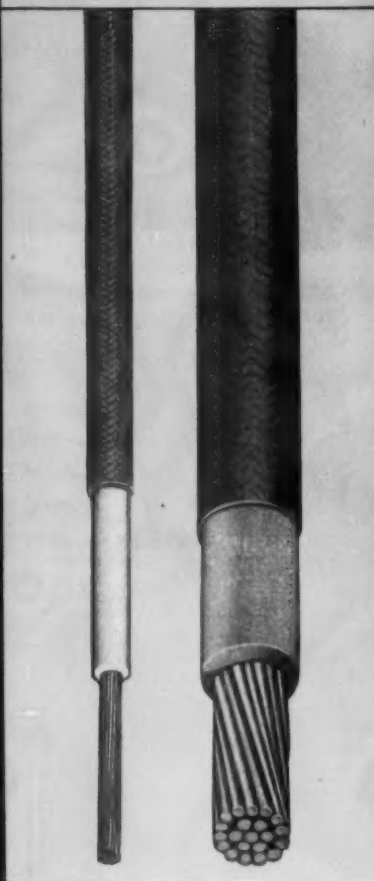
Underwriters' approved switch-
board wires. Recommended for
switchboards, control panels, in-
duction heating apparatus, hinge
and jumper connections on swing-
ing instrument and synchronizing
meter panels, etc.

For details, ask for catalog 10G.



Max. Operating Temperature 167°F
(75°C)

Rockbestos PNR (polyethylene, nylon
and polyvinylchloride) insulated

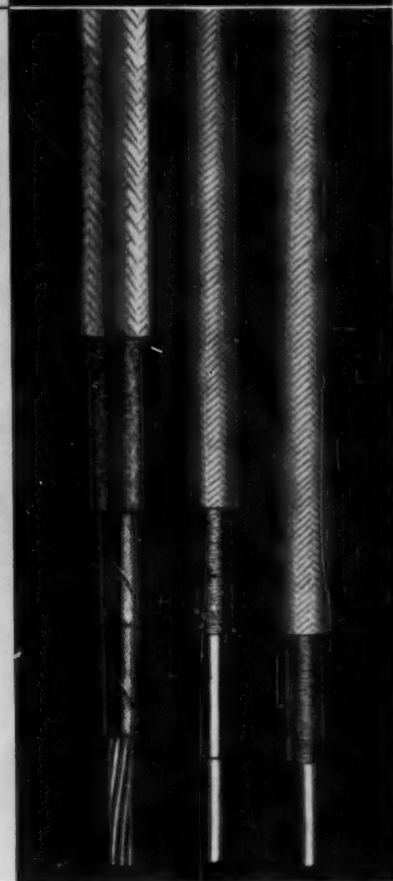


Max. Operating Temperature
257°F (125°C)

1. Rockbestos silicone rubber in-
sulated appliance and fixture wire

Max. Operating Temperature
392°F (200°C)

2. Rockbestos silicone rubber in-
sulated motor lead wire



Max. Operating Temperature 194°F
(90°C)

1. Asbestos, varnished cambric —
Type AVB

2. Thermoplastic and asbestos —
Type TA

3. Thermoplastic Insulated — Type
TBS

CKBESTOS

CAMBRIC · SILICONE RUBBER · TEFLON* · THERMOPLASTIC INSULATIONS
ORATION · NEW HAVEN, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS • ATLANTA
DALLAS • SEATTLE • LOS ANGELES • BURLINGAME, CALIFORNIA

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . APRIL, 1959

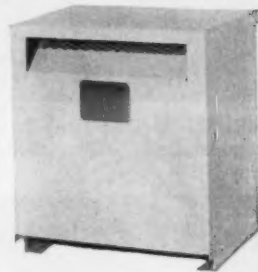
General Electric introduces smaller,



lighter...

QHT* dry-type transformers

*New line cuts size up to 50 per cent,
weight up to 35 per cent and is up
to 15 decibels quieter than previous
models.*



QHT dry-type transformers give you, in every rating, in every application, a balanced combination of small size, lightweight, superior installation features, high-temperature insulation and quiet operation. This combination means easier installation and practically eliminates the major sources of dry-type transformer complaints, noise and insulation failure.

Installation is easy with the new dry-types because the units are built with convenient knock-outs, large terminal compartments and wiring spaces which are easily accessible from the front. Lifting provisions are made for units weighing more than 65 pounds. These new transformers can be located at the load which eliminates the need for long costly low-voltage feeders. No vaults, barriers, or ventilating fans are required.

A new insulation system—QHT dry-types have silicone impregnated insulation, highly moisture resistant, with an inherent ability to withstand high operating temperatures. Combined with materials such as aluminum conductors and cold-rolled grain-oriented silicon steel, you get a smaller, lighter, quiet dry-type transformer designed for years of service.

The new transformers are quiet—all have sound levels equal to or less than NEMA Standards. The rigid welded design of the units helps eliminate lamination vibrations, and on the larger units, built-in rubber mountings reduce noise transfer through conduits and mounting brackets.

Complete stocks of the new transformers are available at local electrical distributors. Single-phase units are built for applications through 167 KVA and three-phase ratings are available up to and including 500 KVA.

It will pay you to investigate how you can save on installation costs, get customer satisfaction, and be competitive, with General Electric's complete new line of quiet QHT dry-type transformers. Section 411-7, General Electric Company, Schenectady 5, New York.

*Quiet, High Temperature dry-type transformers.

GENERAL ELECTRIC



**SECTION B411-7,
GENERAL ELECTRIC COMPANY
SCHENECTADY 5, NEW YORK**

Please send me the new Buyers Guide, GEC-1047.

NAME

TITLE

COMPANY

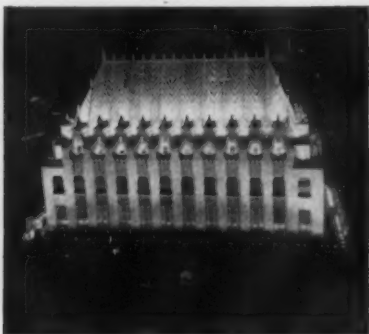
ADDRESS

CITY

ZONE STATE



PERIMETER LIGHTING helps prevent trespassing and costly pilfering.



ARCHITECTURAL LIGHTING will add prestige and beauty to buildings.



SHOPPING CENTERS boost night-time business when brightly lighted.



LOADING DOCKS become safer, more efficient when properly lighted.



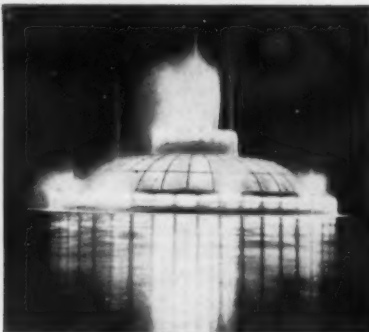
FACADE LIGHTING gives safety, identification to building and store fronts.



GRAND COULEE DAM lighted by 742 General Electric 1500-watt floodlights.



RAILROAD YARD lighting cuts accidents, thefts, and costly freight damage.



FOUNTAINS assume day-time beauty with brilliant, multi-colored floodlights.



NIGHT CONSTRUCTION is safer and more practical with floodlighting.



ATHLETIC FIELD lighting lengthens the time available for fun and play.



DOCK FACILITIES nighttime usage is greatly increased with floodlights.



TENNIS COURTS attain round-the-clock use with modern floodlighting.



STORAGE YARDS can be just as accessible at night as they are by day.



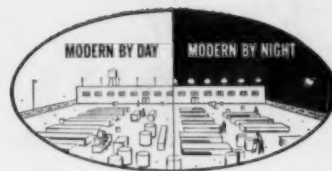
PLANT ENTRANCES need modern lighting to facilitate visitor checking.



GUIDE SIGN lighting adds convenience, safety to highway travel.



AIRPORTS become safer, and more convenient with proper floodlighting.



When light means more safety, fun, beauty, or efficiency, General Electric floodlights will do it best—at least cost

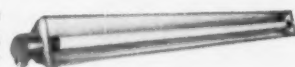
As floodlights in these 16 areas are switched on there is an immediate addition of beauty, safety, efficiency. Nighttime crowds fill the lighted recreational areas; movement of raw materials and finished goods is speeded on lighted loading docks; a fountain with multi-colored lights becomes a nighttime landmark.

These are typical results of proper outdoor lighting. The benefits are many—the applications unlimited. But, regardless of the job to be done—from Grand Coulee Dam to highway guide signs, from Milwaukee's County Stadium to railroad yards—General Electric has the experience to do the job best . . . and a full line of floodlights designed to do it at least cost:

FILAMENT OR MERCURY LIGHTING is simple with any of General Electric's L-69A (high efficiency), L-100 (general-purpose enclosed), or L-55 (economy open-type) units. Each of these floodlights features G.E.'s exclusive "diamond back" reflector . . . designed to deliver from 5% to 35% more light . . . and distribute it more uniformly.



FLUORESCENT LIGHTING units are available in 4-, 6-, and 8-foot lengths. Two housings are offered—one for G.E.'s High Output lamps—the other for G.E.'s Power Groove lamps.



Here's an added benefit—over 500 conveniently located distributors ready to supply G-E floodlights from stock or by prompt shipment: Call one of them—or send in coupon below:

GENERAL ELECTRIC

Section B450-17, General Electric Company, Schenectady 5, N. Y.

Please send me free information on:

☐ Filament floodlighting ☐ Mercury floodlighting ☐ Fluorescent floodlighting

Name _____

Street _____

City _____

State _____

Specify McGILL® Levolver® switches

...for guaranteed precision plus durability



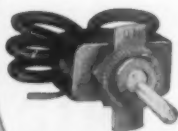
The high standards of design, craftsmanship and material selection make it possible to guarantee No. 41 LEVOLIER switch unconditionally against failure in lighting circuits. This extra quality is reflected in the performance of all LEVOLIER switches.

It pays to specify the best to avoid frequent and costly replacement. LEVOLIER canopy, toggle, push button and momentary contact switches easily withstand the hard use and abuse of industrial service. All are Underwriters' Laboratories inspected.

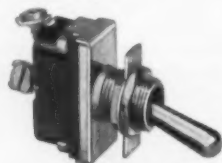
UNCONDITIONALLY GUARANTEED No. 41 single-pole, single-circuit, universal lever switch 6 amp. "T" 125V—3 amp. 250V. Only $\frac{3}{8}$ " thick, it is ideal for conduit box and canopy mounting for lighting and FHP motor control.



No. 100 single-pole, 15 amp. 125-250V, 1 HP 120-240V AC, normally "OFF" momentary contact switch. 1 amp., 125V— $\frac{1}{2}$ amp., 250V DC. Especially suitable for limit and safety control of industrial machinery.



No. 25 toggle switch carries a 6 amp. "T" 125V, 3 amp., 250V rating with an S.P.S.T. double-break mechanism. $\frac{1}{3}$ HP AC 120-240V. Ideal for panel board, FHP motors, appliances, power tools, etc.



No. 90 $\frac{3}{4}$ HP capacity, 15 amp. 125V, 10 amp. 250V toggle switch with an S.P.S.T. mechanism. Designed for AC operation. Also carries 20 amp. 125V AC non-inductive load for heater applications. Also available in two circuit with center off and no off. Choice of terminals.



No. 29 single-circuit, .75 amp., 125V, normally "ON" momentary contact switch. Excellent for automatic control of lights as in door openings and closings.

No. 71 single-pole, single circuit, universal lever switch . . . the thinnest 6 amp. "T" 125V—3 amp. 250V switch of its kind on the market today—only $\frac{15}{32}$ " thick. Also with push button.

For complete descriptions of the entire McGILL line of switches, sockets, portable lampguards and other electrical specialties, write for catalog No. 84.

AVAILABLE FROM YOUR ELECTRICAL WHOLESALER

engineered electrical products

McGILL



precision needle roller bearings

McGILL MANUFACTURING COMPANY, INC., ELECTRICAL DIV., 450 N. CAMPBELL ST., VALPARAISO, INDIANA

WHY SLIPKNOT TAPES ARE SOLD ONLY THRU RECOGNIZED DISTRIBUTORS

MOVING goods costs money. Your full-functioning distributor keeps your costs down. Without him, here's what would happen:

- To visit every contractor, dealer and industrial plant, we'd need at least 300 more salesmen.
- We'd also need ten times more office help, packers and shippers.
- Moreover, you'd never get the wonderful service you get now. Your distributor stocks plenty of Slipknot Tape, and gets it to you *fast*.
- To keep abreast of new products and market changes, you'd have to see hundreds of salesmen every month.
- Your repeat business is vitally important to your distributor — and that's why he stocks only the highest quality lines.
- You'd be charged for freight, too — but if you're in a metropolitan free delivery zone, your distributor delivers to you without charge.

Slipknot Electrical Tapes — Friction, Plastic, Rubber — are the best you can buy . . . and you *buy best* from your distributor. Neither of us could get along without him.



PLYMOUTH RUBBER COMPANY, INC.

QUALITY SINCE 1896

CANTON, MASSACHUSETTS

PROOF! Look how much Blackhawk S-140 electric benders saved over use of manufactured elbows:

PIPE SIZE	NUMBER OF ELBOWS BENT	SAVING
2"	50	\$220.50
2½"	90	823.50
3"	60	629.40
3½"	40	646.00
TOTAL SAVINGS USING BENDERS (based on local cost factors)		\$2,319.40

Time and material records kept by contractor on this hospital job proves how much you save with Blackhawk benders by eliminating manufactured elbows, couplings, extra pipe cutting and threading operations:

\$2,319 saved on one job with "one-shot" Blackhawk Benders



On just one Midwest hospital pipe bending job, this contractor saved \$2,319 over the cost of purchased elbows and couplers by using 4" Blackhawk S-140 electrical benders!

Now, thanks to the brand new Blackhawk P-550 2-speed electric pump—your opportunities to save are *even brighter!* Why? Because the new P-550 electric pump teamed with a Blackhawk featherweight aluminum "one-shot" bender cuts bending time to 50% of that required by any other bender! Then you're set for *low-bid, high-profit* business during the coming construction rush!

NEW! super-fast 2-speed pump will break even more records!

- P-550 workhorse is 50% faster than any other electric pump!
- Two-speed action—fast approach to load . . . twice the speed under load!
- Starts safely under full load!
- Safest, quietest, most powerful portable electric pump on the market!

Ask for TRY-BEFORE-YOU-BUY Demonstrator Kit!

Here's your big chance to try a "one-shot" Blackhawk bender and P-550 pump on-the-job. A golden opportunity to compare before you buy . . . to actually see how much more profit you can make on every job. You pay as you profit! Many distributors are offering interest-free extended terms . . . up to six months to pay!



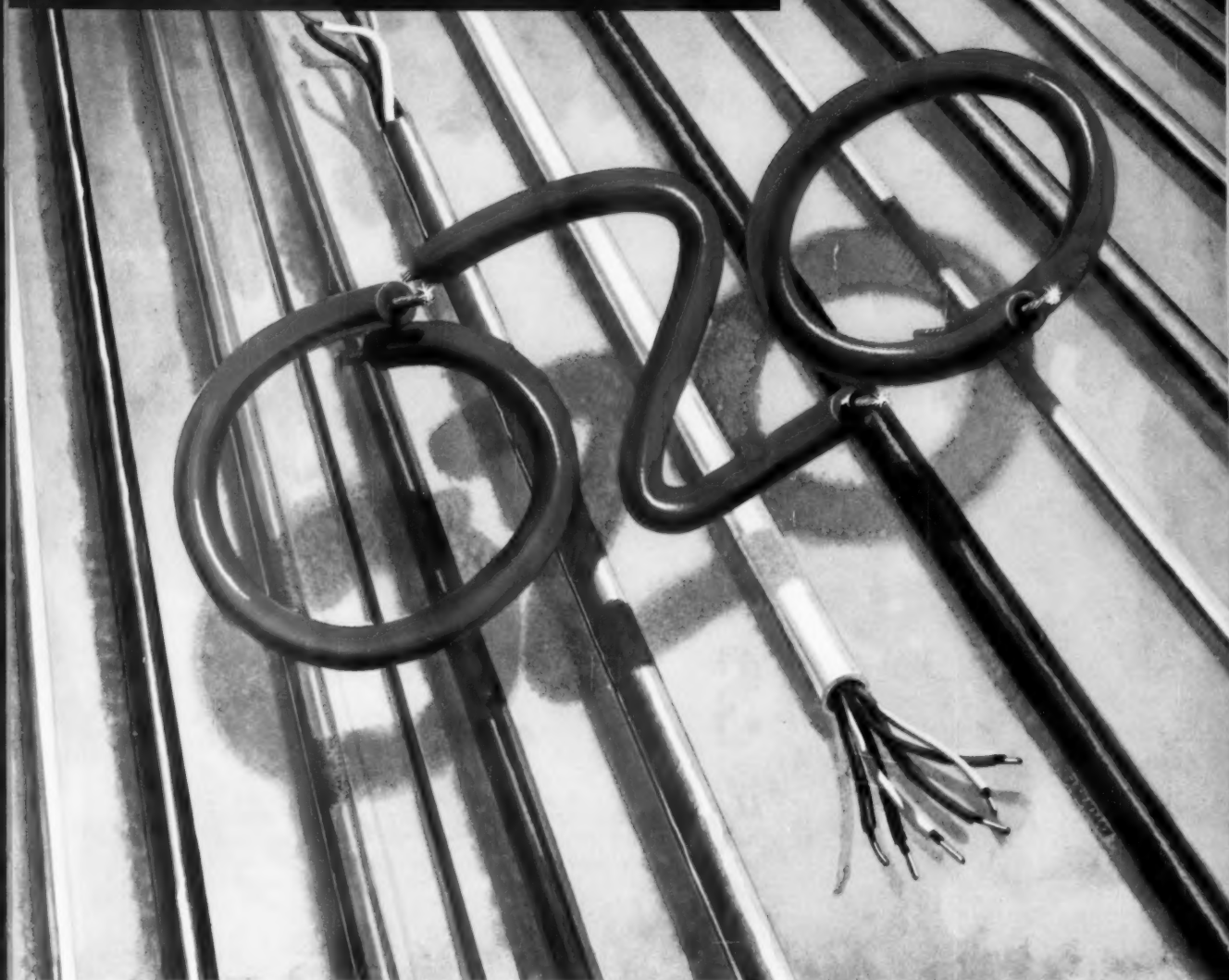
BLACKHAWK®

BLACKHAWK MFG. CO., Dept. H-2049, MILWAUKEE 46, WIS.

"World's Most Complete Line of Hydraulic Tools"

NAUGATUCK PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER



Now—the finest wire jackets can be *Colored!*

FOR SALES APPEAL • FOR SERVICE EASE

New Paracril OZO—a superior rubber compound developed by Naugatuck—makes possible new eye appeal, new ease of identification. And it outperforms standard wire jacket compounds many other ways, too!

Compare new PARACRIL OZO with other wire jacket rubbers. Prove for yourself, new PARACRIL OZO gives:

- significantly superior ozone resistance
- greater fuel and oil resistance
- much greater abrasion resistance than standard jacket

compounds

- excellent processability, with particularly fast extrusion
- permanent retention of bright colors!

If you are not already using PARACRIL® for your wire jacket compounds or similar products requiring such properties, chances are 1000 to 1 it's because you haven't yet tried PARACRIL OZO.

Why not try it—soon. Contact your nearest Naugatuck representative at the address below.



Naugatuck Chemical

Division of United States Rubber Company

434P Elm Street

Naugatuck, Connecticut



**WAGNER PROTECTED TRANSFORMERS
USED IN UNIQUE DISTRIBUTION SYSTEM:**



Willis Lipscomb, Consulting Electrical Engineer, and Joachim E. Liebmann, Harbor Engineer, examine emergency overload feature on a 75 Kva, 3 phase Wagner Protected Transformer. The other Wagner Transformers are each 50 Kva, single phase.

POWER for the Port of San Diego



Keeping pace with the rapid industrial growth and increased shipping needs of the Southwest has meant a tremendous construction job for the Port of San Diego . . . now the third largest port on the West Coast.

The largest, most modern of San Diego's port facilities is the new 10th Avenue Terminal, capable of handling 9 large ocean going vessels at one time.

Facilities like this need plenty of dependable electric power. To distribute this power, the 10th Avenue Terminal has a 12,000 volt distribution system powered by Wagner Protected Subway Transformers. Each transformer has a main secondary breaker to clear any overload or fault. The primary side of the transformer has an internal weak link to protect the line. Each transformer vault has two service lines, a preferred and an alternate, connected to each transformer through a throw-over switch. The system is unique, safe, and economical. Wagner Protected Transformers make it possible to eliminate expensive submersible primary fuses.

Consult your nearby Wagner Sales Engineer about modernizing your power distribution system. There are Wagner Branches in 32 principal cities.

Consulting Electrical Engineer, W. L. Lipscomb, San Diego, Calif. Electrical Contractor, Standard Electric Contracting, Inc., Chula Vista, Calif.

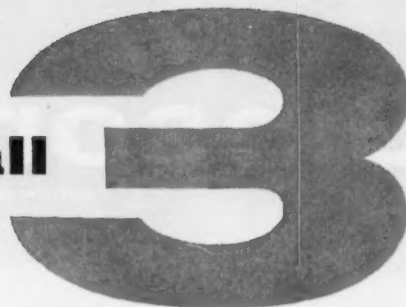
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U. S. A.

WTS9-1

Diamond has all portable cords



Red-D-Prene® Neoprene Sheathed



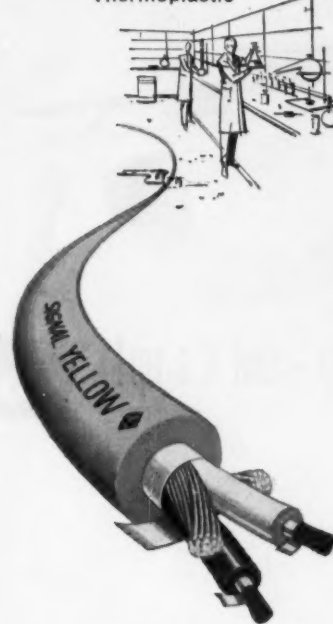
for hot, oily locations

Black Diamond Rubber Sheathed



for general purpose use

Signal Yellow Thermoplastic



for all locations where heat
is no problem



Red-D-Prene for mill and plant use is designed with tough, oil, heat and flame resistant Type MD (Mill Duty) neoprene jacket in industrial red for ready identification.



Black Diamond has durable rubber jacket protecting against alkalis, acids and moisture. Very flexible construction prevents kinking in service.



Signal Yellow has a jacket of yellow thermoplastic that is quickly seen... clean to handle... smooth sheath will not readily collect dirt. Easy to pull.

DIAMOND IS ALSO A PRIME SUPPLIER OF



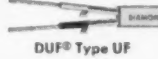
DTW Small Diameter
Building Wire



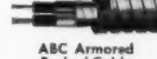
DTX® Non-Metallic
White Sheathed Cable



Type SE Service
Entrance Cable
(Armored & unarmored)



DUF® Type UF



ABC Armored
Bushed Cable



Range Cord Sets



DIAMOND

WIRE and CABLE Company

Sycamore, Illinois

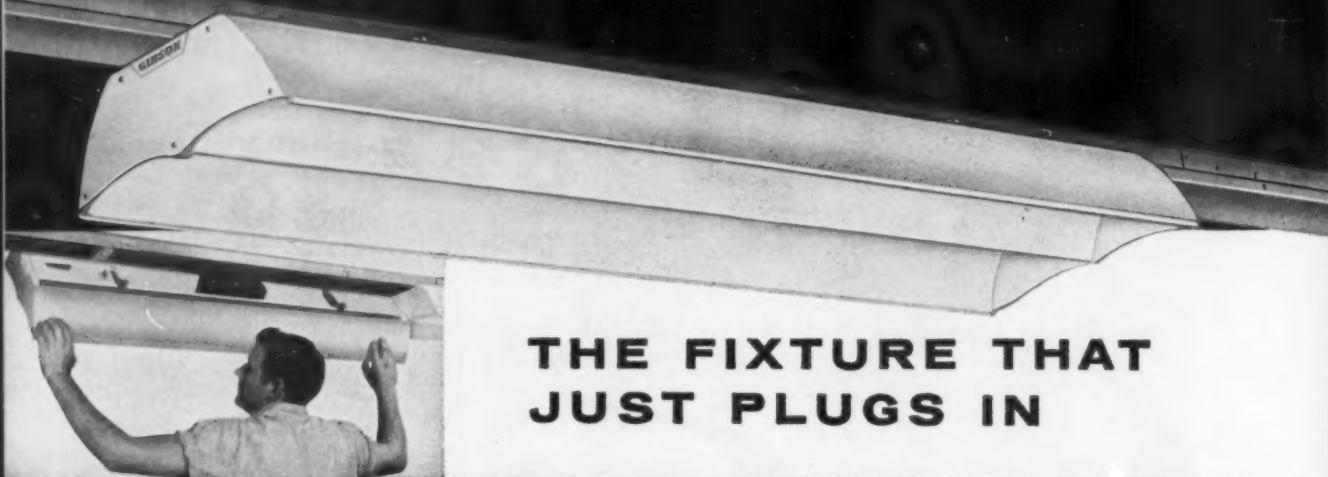
WAREHOUSE: BIRMINGHAM, ALABAMA

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . APRIL, 1959

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Gibson Ortho 88

PATENT PENDING



**THE FIXTURE THAT
JUST PLUGS IN**

snap - and it's up!

ortho-88

Made in 48" and 96" lengths for the following lamps:

Rapid Start
Slimline
800 ma R. S.
Power Groove
VHO and SHO

All fixtures, except the 40 w. Rapid Start, are interchangeable on the Uni-Race with all other fixtures of the same length.

4 SIMPLE STEPS

**THAT SAVE OVER 75%
IN INSTALLATION TIME**

Contractors report that all labor, including rods or stems and lamping, for a Gibson Ortho installation averages only 17 to 22 man-minutes per fixture, as compared with the NECA standard of over 2 man-hours for conventional fixtures.



1 Assemble the Uni-Race • The exclusive Gibson Raceway known as the Uni-Race can be assembled on the floor in lengths up to 48 feet. The four or eight-foot sections are joined by telescoping couplers which provide a smooth, rigid union of the sections and are fastened with self-tapping screws.

WRITE FOR COMPLETE INFORMATION ABOUT THE GIBSON ORTHO LINE



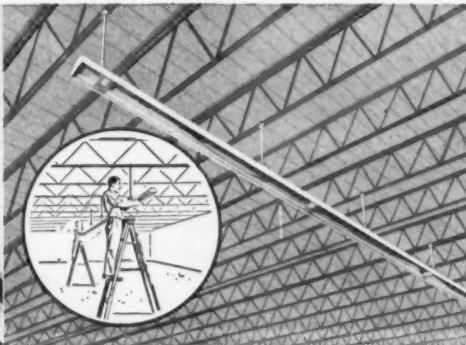
Add, remove, re-space fixtures **any time without tools or rewiring**



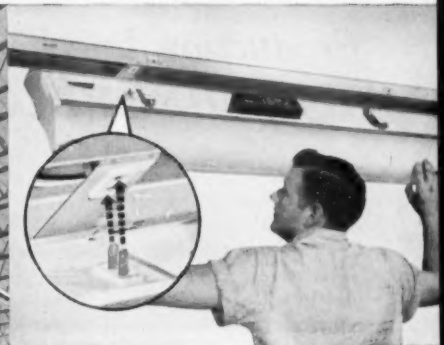
The unique design of the Gibson Ortho, with its exclusive Uni-Race, makes it the world's most versatile fixture. Instead of being wired permanently to the branch circuit, it simply plugs in—like an appliance. A plug built into the fixture engages a receptacle in the Uni-Race, and since the receptacles are positioned at 48" or 96" fixture intervals along the Uni-Race, spacing of the fixtures is automatic. They can be mounted in continuous rows or spaced at intervals of 4, 8, 12 or more feet. Fixtures can be added or removed any time, according to the requirements of plant layout. Such changes need no electrical work whatever. They can be made by one man without tools. Think what this saves the owner whenever the lighting layout has to be re-arranged or when a fixture must be removed for repairs or cleaning!



2 Wire the Uni-Race • Branch-circuit wires are laid in the Uni-Race and connection is made at each built-in receptacle. The receptacles will later receive the plug that is built into each fixture. The Uni-Race is U.L. approved as a raceway with a capacity of five No. 8 AWG wires or eleven No. 14 wires.



3 Hang the Uni-Race • The rigid Uni-Race is easily lifted and hung in any of several different ways. Lengths up to 48' can be hung as a unit if supported every 24' while being raised to mounting position. When the branch-circuit connection is made, the Uni-Race is ready for the fixtures.



4 "Plug In" the Fixtures • The fixtures are merely "plugged in" on the Uni-Race. Hooks on the fixture engage in slots on one side of the Uni-Race, acting as hinges. The fixture is swung closed and latched. The built-in plug on the fixture automatically connects with the receptacle in the Uni-Race.

GIBSON MANUFACTURING COMPANY

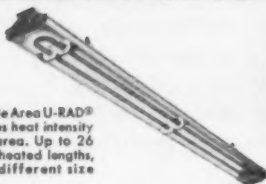
1919 PIEDMONT CIRCLE, N.E.

ATLANTA 9, GEORGIA

Manufactured in Canada under franchise by Electrolier Manufacturing Co., Ltd., Montreal



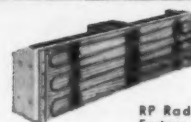
Type RAD Heater—Used singly or joined to form ovens or heating banks. Standard lengths from 24 3/4" to 85 3/4".



Adjustable Area U-RAD®—Matches heat intensity to work area. Up to 26 different heated lengths, using 6 different size elements.



FRS Metaray®—No glass, no glare. Fits your present lamp sockets.



RP Radiant Panels—Factory assembled sections. Sizes from 12" x 48" to 24" x 66". Work temperatures to 700°F.

Production line heating problems? Your CHROMALOX Man has the Answers

Unrelated as they may seem, the products shown above have at least one thing in common . . . each presented an unusual heating problem, and Chromalox Electric Far-Infrared provided the best answer.

To cure a long-lasting, no-chip, no-peel finish, the plastic bodies of Cushman Motor's "Mailsters" receive baked enamel treatment in an oven heated by Chromalox type RAD Heaters.

Vacuum forming of plastics poses other problems handled by Chromalox Far-Infrared. To obtain deep draws in plastic door liners for refrigerators, Admiral Corporation uses a bank of Chromalox U-RAD® Heaters.

Chromalox Far-Infrared has proved to be the best heat source for many other materials, too. For example, when radiant heat lamps proved too "spotty" for curing General Tire & Rubber Co. white sidewalls, the oven was refitted with 150 Chromalox Metaray® Heaters.

Loss due to shelf spoilage of dog food is still another

type of problem solved by Chromalox Far-Infrared. The manufacturers of Joy Dog Food use Chromalox Far-Infrared panels installed over the conveyor line to sterilize their product before packaging.

Chances are you have a production line heating problem that can best be solved with Chromalox Far-Infrared Heat. You can soon find out—just call your Chromalox Man. He's backed by the world's largest stock of industrial electric heaters, ready for immediate shipment. And he offers factory design-engineering service for special applications.

2612



CHROMALOX
Electric Heat

INDUSTRIAL • COMMERCIAL • RESIDENTIAL

EDWIN L. WIEGAND COMPANY
7637 Thomas Boulevard • Pittsburgh 5, Pa.

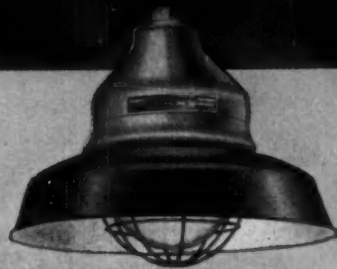
the **S**witch is to **PYLE-NATIONAL**

industrial lighting fixtures

EXPLOSION-PROOF

LE Series (Class I, Groups C and D)
60 to 500 Watts
Choice of body and reflector styles

EXPLOSION-PROOF Floodlights
FEA Series 150 to 300 Watts



DUST-TIGHT

DE Series (Class II, Groups E, F and
G and Class III)
60 to 200 Watts
Choice of body and reflector styles



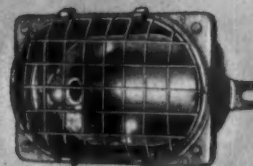
VAPOR-TIGHT

DO Series 10 watt signal
or pilot lights
BO Series 50 to 500 watts
Choice of body and reflector styles



FLUSH VAPOR-TIGHT

Type 1570 Pit and subway lights
100 and 200 watts



Literature Furnished On Request



Sold Nationally Through Authorized Distributors

THE PYLE-NATIONAL COMPANY

WHERE QUALITY IS TRADITIONAL

1344 N. Kostner Avenue, Chicago 51, Illinois

Branch Offices and Agents in Principal Cities of the U.S. and Canada • Canadian Agent: The Holden Co., Ltd., Montreal

Railroad Export Department: International Railway Supply Co., 30 Church St., New York 7, N.Y.

Industrial Export Department: Rocke International Corp., 13 E. 40th St., New York 16, N.Y.

CONDUIT FITTINGS • PLUGS AND RECEPTACLES • TURBO-GENERATORS • MULTI-VENT AIR DISTRIBUTION

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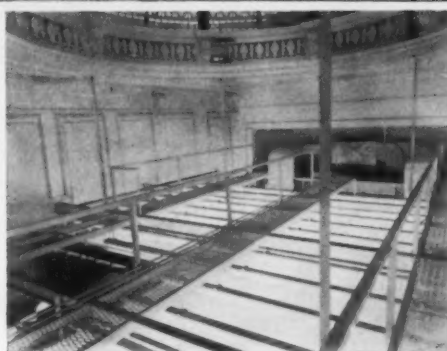
Remodelling? Give the Lighting a Fresh Look with a Luminous Ceiling by **LITECONTROL!**

Here's another "team job" where architect, electrical engineer, electrical contractor (and the customer) obtained excellent results with standard Litecontrol equipment, at sensible cost!

The architect had to come up with a solution to the deep, high ceilinged area and he did. He modernized this old-fashioned interior adroitly—made a handsome, well illuminated banking area by running I-beams across the dome, and suspending Litecontrol's integral Luminous Ceiling from the beams. (note small photo.) Lamps may be easily serviced from the catwalks.

The diffusing medium (upper photo) is plastic grid louvers. Beauty of this material is that it is easy to work with (it was cut "tailor-made" around the curve of the soffit) . . . it is lightweight . . . translucent . . . and has the functional low brightness look with high light transmission onto the work surfaces. The shielding angles are noteworthy — 45° x 45°. **RESULT:** A lighting job of overall distinction.

Whether you are starting "from scratch" or are remodeling, have a "problem" installation (or not), there is a way to do it better with LITECONTROL.



INSTALLATION: Portsmouth Trust Co., Portsmouth, N. H.

AREA SHOWN: Main Banking area

ARCHITECT: W. H. Jones & Son, Melrose, Mass.

ELECTRICAL ENGINEER: Martin E. Keane Associates, Boston, Mass.

ELECTRICAL CONTRACTOR: Walter Reddin, Portsmouth, N. H.

DISTRIBUTOR: Mass. Gas & Electric Supply Company, Portsmouth, N. H.

FIXTURE: Litecontrol Luminous Ceiling, using molded plastic grid louvers. Slimline single-lamp strip fixtures on 24" centers.

INTENSITIES: Top of tellers' counters, average 72 foot-candles in service.

Work area on tellers' counters, average 63 foot-candles in service. Overall average throughout room, 52 foot-candles in service.


LITECONTROL

Fixtures

KEEP UPKEEP DOWN

LITECONTROL CORPORATION,

36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

NOW...all

ETP

fittings
are

Chromate Plated

FOR LASTING PERMANENCE!

...AT NO INCREASE IN PRICE!

Concrete tight!
Every size
connector and
coupling
up to 2".



Why settle for ordinary fittings when ETP gives you all this:

- New tough protection! Sparkling Zinc Chromate over-plating to retard corrosion. Same as tested and approved by the U.S. Government for use in aircraft, rockets and missiles. Salt spray tested.
- Exclusive pre-set, deep-slotted STAKED screws. No backing out for conduit.
- Precision bevelled edges with extra heavy duty locknut.
- One piece solid tubular steel—cannot open or spread. Sized for uniformity.
- Available in $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1", 1 $\frac{1}{4}$ " (one screw type) and 1 $\frac{1}{2}$ " and 2" (two screw type) sizes.
- Concrete tight with heaviest gauge wall thickness! Far surpasses U.L. requirements. U.L. file card E24788.

CONNECT WITH  FOR ECONOMY

ETP

Samples and brochure on request



ELECTRIC TUBE PRODUCTS 74-16 Grand Avenue, Maspeth (N.Y.C.), N.Y. DEfender 5-8000

YOU CAN PROVE

Cutler-Hammer Motor Control

works better . . . lasts longer



New super-life Size 4 Starter
... available as non-reversing,
reversing, and multispeed con-
tactors and starters in the open
type, NEMA 1 and special
purpose enclosures.

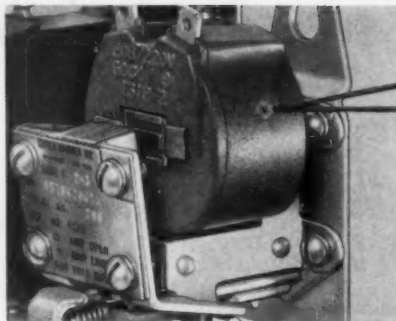
CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wis. • Division: Airborne Instruments Laboratory. • Subsidiary: Cutler-Hammer International, C. A.
Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation.



MOLDED MAGNET COILS

The strength and durability of the Cutler-Hammer Molded Magnet Coil is but one example of how Cutler-Hammer Motor Control is built better to last longer. Rifle bullets couldn't pierce or shatter this coil. What chance is there of it being damaged when an electrician's screwdriver slips or when the coil is dropped? Boiling oil has no effect on this coil. What chance is there of it ever being penetrated by moisture or distorted by high ambient temperatures?



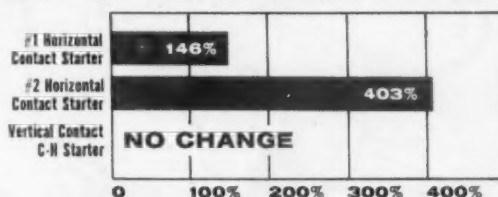
Bullet
after impact

Proof of durability . . . this Molded Magnet Coil works perfectly even after being struck by a rifle bullet and boiled in oil.

VERTICAL DUST-SAFE CONTACTS

To function properly motor control contacts *must* stay clean. And because dust can't collect on a vertical surface, only vertical contacts are truly *dust-safe*. Recent dust-chamber tests of vertical and horizontal contact type motor starters confirm this fact. After four hours of "dusting," the contact resistance of Cutler-Hammer vertical contacts remained constant. But the contact resistance of horizontal contacts skyrocketed, and as contact resistance increases so does heating, pitting, and wear resulting in rapid contact failure.

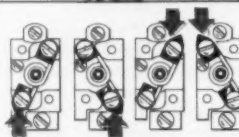
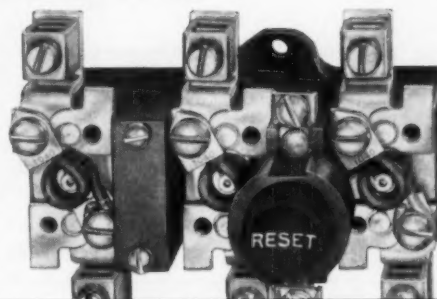
PERCENT GAIN IN CONTACT RESISTANCE DUE TO DUST



Dust Environment Test of Vertical and Horizontal Contact Type Motor Control

ADJUSTABLE 3-COIL OVERLOAD RELAYS

Only 3-coil overload relays can provide dependable overload protection for three-phase motors under all operating conditions. Why gamble with costly motor burnouts by using motor control that protects only two of the three motor windings? 3-coil overload relays can be provided in all standard Cutler-Hammer Motor Control, no oversize enclosures, or as an open component for low cost panel mounting. Further, Cutler-Hammer Overload Relays are adjustable to within 3% of full load motor current, not 10% or 12% as others. Cutler-Hammer Overload Relays allow the motor to work up to full capacity, provide positive protection without nuisance tripping.

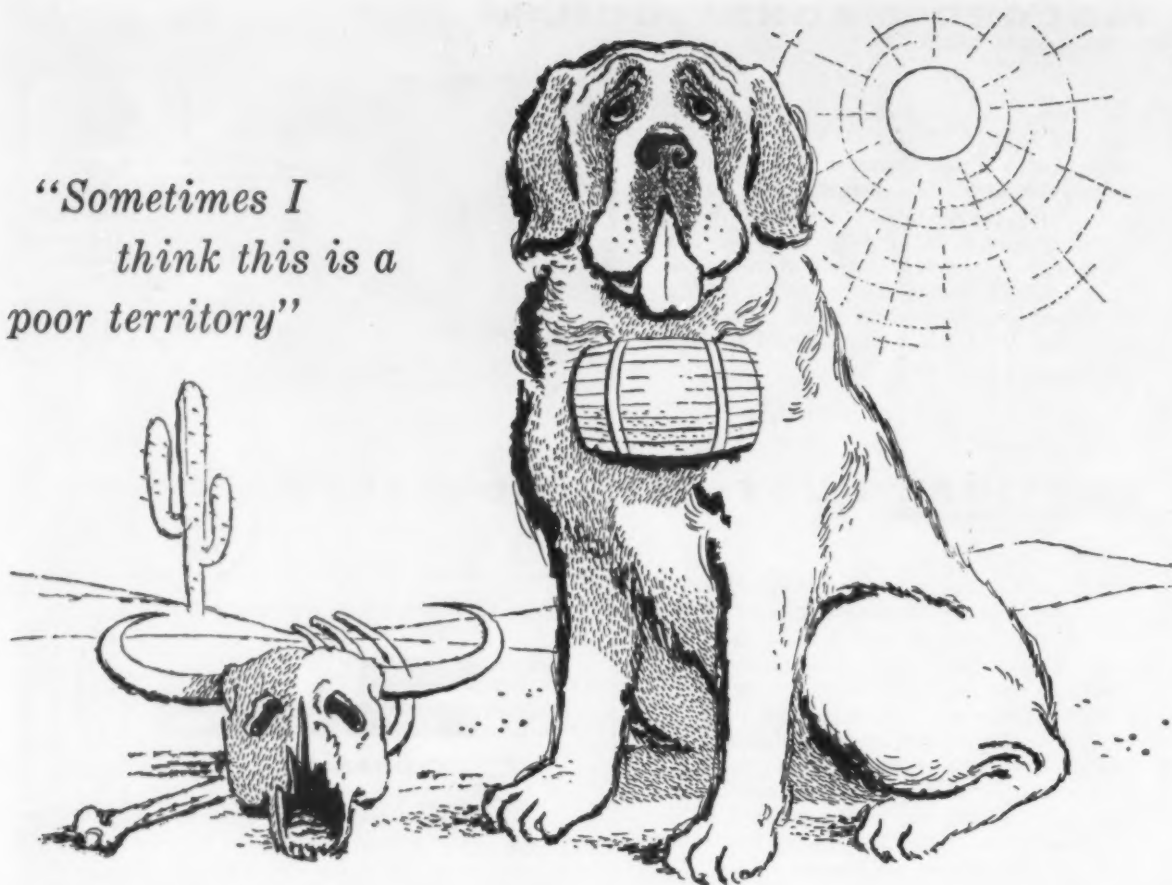


Heater coils can be placed in any of the four positions to adjust the overload trip point to within 3% of full load current.

Molded magnet coils, vertical *dust-safe* contacts, and adjustable 3-coil overload relays are *plus* features that add up to bonus performance wherever Cutler-Hammer Control is used. Why

settle for less when Cutler-Hammer Motor Control costs no more. Write today for Pub. EN150-G241. Cutler-Hammer Inc., Milwaukee 1, Wisconsin.

*"Sometimes I
think this is a
poor territory"*



You can find live prospects and the kind of business you want — through DODGE REPORTS

If you're looking for profitable business in the new construction field, *information* and *timing* are vital. You need detailed facts on what's going on in your market every day. You need to know when and where to *act*. Only in this way can you go after the kinds of jobs that will do you the most good.

That's where *Dodge Reports* come in! They're mailed to you daily. They tell who's going to build what and where—

in your area... in the types of construction in which you're interested. You know at once whether any given project is right for *you*. Follow-up reports tell you when bids (or rebids) are wanted—and even with whom you're competing.

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Send me the book "Dodge Reports—How to Use Them Effectively" and let me see some typical Dodge Reports for my area. I am interested in the general markets checked below.

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Address _____

City _____ Zone _____ State _____



NEW!
savings on
direct burial
feeders

ER CABLE

NEW!
COLUMBIA UF
now in sizes
thru 4/0

1/3 TYPE UF

NEW!
lower material costs
lower labor costs

1/2 TYPE UF

1956 NEC regulations now permit the use of UF in single conductor sizes through 4/0 for direct earth burial (when provided with overcurrent protection) on 600 volt lines. Now you can save both on materials and labor by using Columbia UF in place of other types of more expensive cable or in place of wire and conduit combinations for direct burial applications.

Columbia UF is available in two and three-conductor assemblies, with and without ground wire, and in single-conductor sizes through 4/0.

Approved by Underwriters' Laboratories



COLUMBIA CABLE & ELECTRIC CORP.

Serving the Electrical Wholesaler Since 1912

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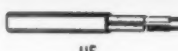
Flex-Seal



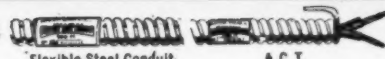
Non-Metallic Sheathed Cable



E. M. T.



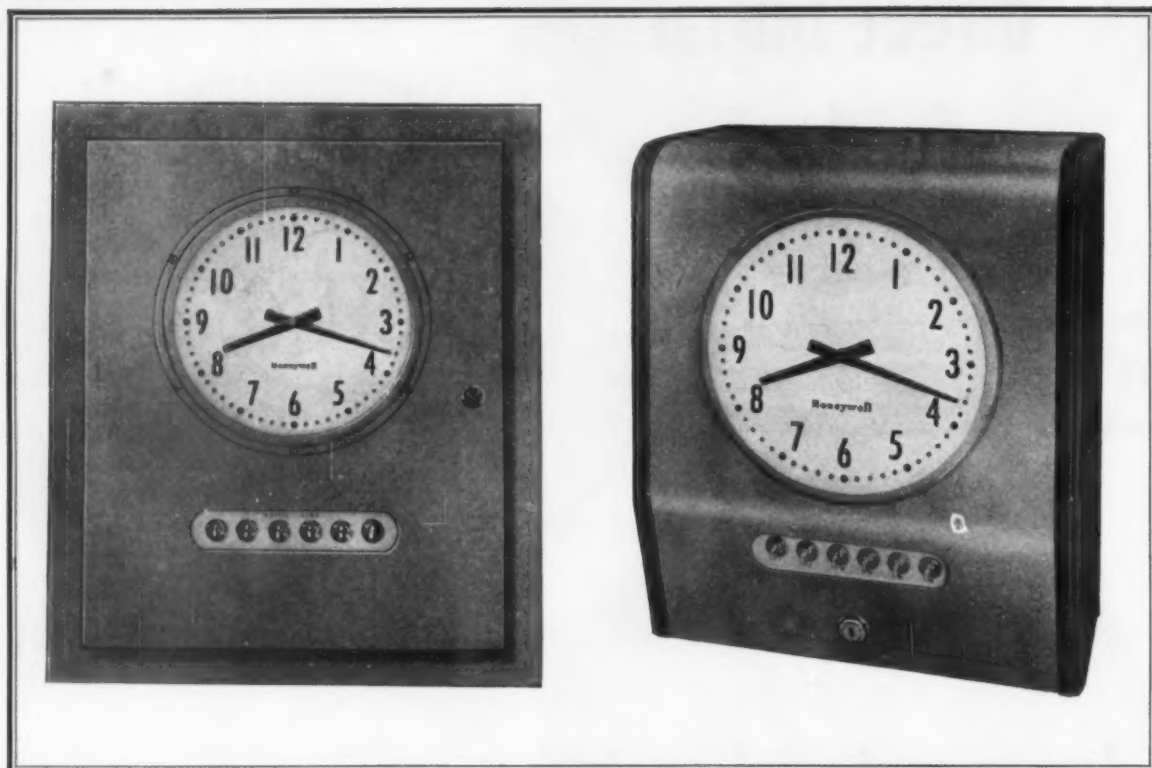
UF



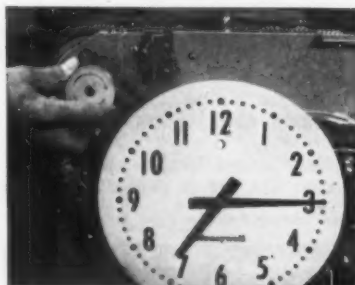
Flexible Steel Conduit

A. C. T.

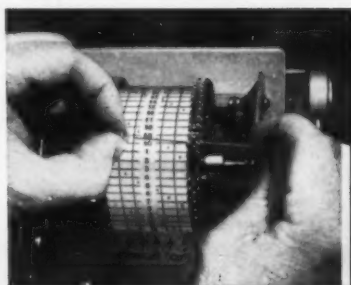
The most dependable ever offered now backs



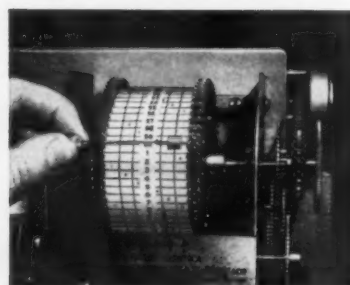
AS AN ADDED BENEFIT TO YOUR CLIENTS—CLOCKMASTER PROGRAMMING IS THE EASIEST TO SET:



1 The same setting wheel used for setting master clock to the correct time is used to set the programmer. Time and program bells are always in step with one another.



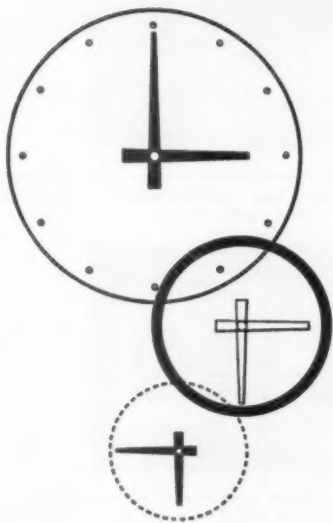
2 Then, simple, reusable steel pin is inserted in chain link opposite minute mark indicating time signal is to sound. Light section is day, dark section is night.



3 Reusable plastic roller slides onto pin, without special tools, to sound program-signal. Any signal can be changed without affecting any other part of program.

nationwide service up **HONEYWELL'S** **CLOCKMASTER*** **SYSTEM**

**A Honeywell expert is always on hand,
beginning with initial clock and pro-
gramming planning . . . continuing through
years of efficient, convenient service.**



Honeywell sales engineers work closely with architects and engineers in planning a master time and programming system.

During installation, experienced Honeywell installation supervisors are present to answer any questions and check the finished job. Once the system is in operation, Honeywell's factory-trained men provide free service for one year. Then Honeywell offers a low-cost maintenance plan that includes regular inspections and prompt, efficient service by skilled men who are available immediately when needed from 112 Honeywell offices throughout the country. There is one in your area.

Handsomely-designed Honeywell clocks come in dial sizes of 9, 12, 15 or 18 inches. They may be flush or surface mounted. They're easy to install and have standard plug-and-socket connections.

For more information about Honeywell's Master Time and Programming Systems, call your nearest Honeywell office. Or write Minneapolis-Honeywell, Dept. EC-4-04, Minneapolis 8, Minnesota.

*Trademark

For specification details see Sweet's
Architectural File 33b/Mi.

Honeywell



First in Control

ALLIS-CHALMERS
low voltage
switchgear

Here's
**Proven
Accuracy**

**3 independent
elements available
in series trip device**

This time-proven feature of Allis-Chalmers low voltage switchgear provides:

- **Accurate settings** — Adjusting knobs with calibration scales on front of trip device permit operator to adjust elements independently and set pickup for long time (80-160%), short time (500-1000%), and instantaneous (500-1500%).
- **Accurate action** — Silicone oil-filled, positive displacement time-delay device is completely calibrated and sealed under vacuum.
- **Accurate adjustment** — Minimum, maximum and intermediate time-delay band settings are field adjustable for each pickup value for fine selectivity.
- **Accurate indication** — Overcurrent trip flag to indicate phase which caused tripping of breaker is available.

Each trip element has its own armature and each armature acts directly on trip block. Accurate trip device is only one feature of Allis-Chalmers low voltage switchgear. For complete details, call an A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

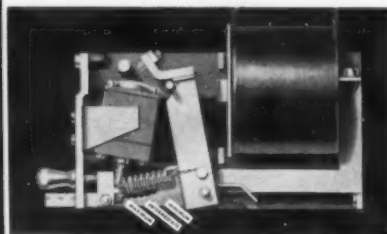


A-5553

ALLIS-CHALMERS



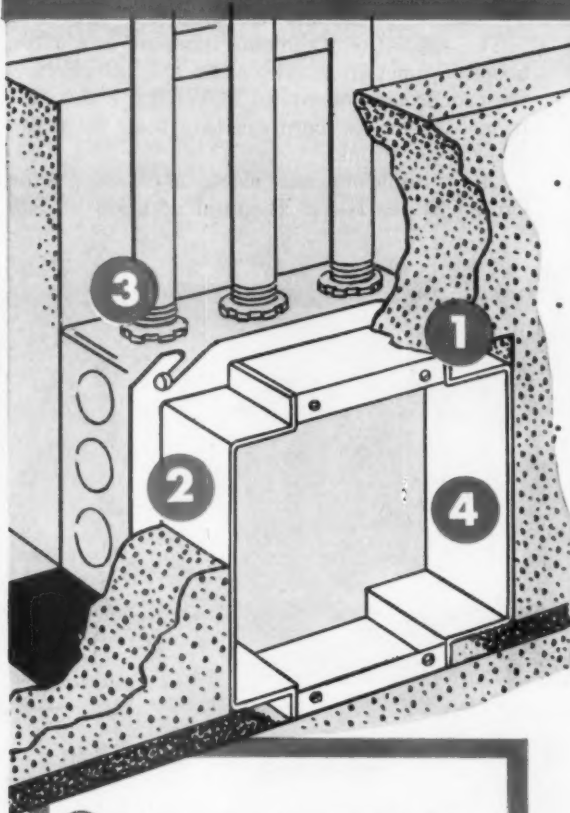
Operator inserting circuit breaker using positive-position pantograph. Note trip device accessibility, dead-front breaker, and drawout interlock.



Cutaway shows arrangement of components in Allis-Chalmers direct-acting series trip device. Note calibration scale below adjusting knobs and time band setting on armature extension.

NEW RACO 4" SQUARE TILE COVERS

with device mounting holes inside

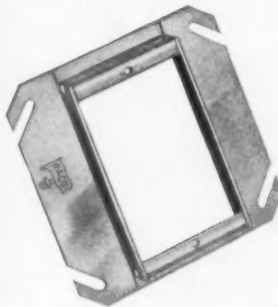


- 1 Flanges turn in — no plugging of device mounting holes
- 2 No chamfering or beveling required because of RACO'S straight-side design
- 3 Raco single or two-device tile covers fit any 4" square box
- 4 6 covers—choice of depths for every type wall construction

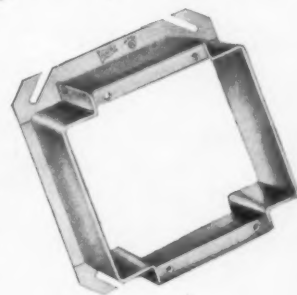
.....eliminate drilling or chipping to clear mounting holes
 ...full range of depths- $\frac{1}{2}$ " to 2" in single and two-device styles
 ...designed to provide a faster, neater installation

Raco 4" Square Tile Covers simplify and eliminate many installation problems. There's a range of depths in single and two-device for all types of wall thickness which provides a finished appearance and permits easier accessibility in wiring. Engineered for quick, easy mounting. Raco Covers have straight-side design which eliminates chamfering or beveling. Flanges are turned in, keeping device mounting holes from being plugged. This is a big advantage. Investigate the time-saving benefits.

You can always rely on Raco



Single-Device Tile Cover



Two-Device Tile Cover



ALL-STEEL EQUIPMENT INC.
 AURORA, ILLINOIS



Panelboard planning helps

The special requirements inherent in modern hospital function make design and selection of the proper components to POWER-UP the electrical system far more exacting than for many other applications.

One example of careful electrical planning is the United States Naval Hospital addition at San

Power-up San Diego Naval Hospital

Diego, California, where Westinghouse Panelboards were specified to serve as the vital nerve centers of the hospital electrical distribution system.

In addition to several Westinghouse switchboards, a total of seven Westinghouse type CDP power distribution panelboards and 64 type NA1B

lighting panelboards were installed in the new 1000-bed addition to the naval hospital.

Find out how Westinghouse Panelboards can help you POWER-UP for greater profits; contact your nearby Westinghouse office, or write: Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania.

J-93544



United States Naval Hospital, San Diego, California

ARCHITECT-ENGINEERS: Welton Becket and Associates, Los Angeles, California

GENERAL CONTRACTOR: George A. Fuller Co. Los Angeles, California

Hospital electrician examines Westinghouse NA1B Panelboard on corridor wall. Each of these 64 panelboards controls 40 different hospital lighting circuits.



Architect Engineers: Welton Becket and Associates

YOU CAN BE SURE...IF IT'S Westinghouse



NOW!

... a 4' x 4' Recessed Unit to complement Sylvania's New Troffer Series

Now at your command—shallow recessed fixtures in 1', 2' and 4' widths to fit all modern ceilings.

Sylvania's new Troffer Series represents completeness in every sense of the word. Three separate housing designs

The advanced features found in Sylvania's Troffer Series—shallowness, concealed hinges and latches, variety of housings and shieldings, snap-up hanger and many others—are typical of the inherent advantages built into each and every Sylvania fixture line.

Take a look at Sweet's Architectural File for a quick review of Sylvania's complete and modern line. Better yet—send for a complete fixture catalog today. Leaf through it and you'll soon discover the wide choice of fluorescent lighting equipment offered by Sylvania.

are available to fit quickly and easily into every type of ceiling construction. You get complete choice of shieldings in both one and two foot widths—and in four and eight foot lengths. Matching incandescent Accent Units allow for pattern lighting or the creation of special effects.

To complement this Troffer Series and to expand the design potential of recessed lighting systems, Sylvania now offers a versatile 4' x 4' shallow recessed fixture featuring the same clean, smart appearance and the up-to-date design advantages which permit simpler and faster installation. This attractive 4' x 4' unit places another distinctive and useful lighting tool in your hands.

For complete information on Sylvania's Troffer Series and 4' x 4' units, write to:

SYLVANIA LIGHTING PRODUCTS
A Division of SYLVANIA ELECTRIC PRODUCTS INC.
Department 59-1
One 48th Street, Wheeling, West Virginia

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Fluorescent Lighting Fixtures and Systems

BEST FIXTURE VALUE IN EVERY PRICE RANGE

LIGHTING • TELEVISION • RADIO • ELECTRONICS • PHOTOGRAPHY • ATOMIC ENERGY • CHEMISTRY-METALLURGY

Right off the

Wire

1. Gasoline, oil, air and water are dispersed from a new portable gas station that can roll around the parking areas of shopping centers.

2. A recently patented tape measure multiplies two dimensions to give a result in square inches.

3. Tirex cords and cables have served the mining industry for nearly three decades with an unchallenged record of long service life. Recent tests prove that the ampacity of a Simplex Tirex neoprene armored shuttle car cable exceeds that of an equivalent plastic insulated and jacketed shuttle car cable by 5 to 8 percent under the same operating conditions.

4. A tempering process is being used for glass tumblers which are said to withstand normal falls on even the hardest materials.

5. A new instrument inspects every square inch of paper electronically while the paper machine is running.

6. A full-range electrostatic high fidelity speaker is being made.

7. A miniature lamp, particularly for aircraft wing tips, gives about twice the light of a 100-watt bulb but is smaller than a cigarette.

8. An electric motor that can be reversed in a thousandth of a second is made for servo mechanisms. It weighs a little over one ounce.

9. Points on a graph can be spotted at the rate of 10,000 per second with a new cathode ray printer.

10. Three million bits of information can be stored in a tape recorder small enough to be held in one hand. It is to be used in outer space and can withstand acceleration forces up to 50 G.

11. A new ultra-sensitive detector responds to less than one-twentieth of a billionth of a watt of infrared radiation.

12. Simplex Condex interlocked aluminum armor is now available with a baked enamel finish in a wide variety of colors. Cables up to 4" in diameter or more may be ordered with this new armor for color coding or other identification purposes.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

13. An electronic corrosion meter can detect as little as a millionth of an inch of corrosion inside pipes or equipment.

14. A new electric motor will operate under water at pressures up to 3,000 pounds per square inch.

15. An interesting application of the mercury switch is in an ear-worn alarm for long distance drivers that buzzes whenever the head nods.

16. A laboratory is being equipped to test models of the first ion-rocket engine for flight in outer space.

17. A small helicopter uses the principle of a lawn sprinkler. The rotor tips are driven by compressed air jets supplied by a turbo-jet engine.

18. Rocket motors may now use a high-strength steel in the widest sheets ever made (160 inches). These sheets will materially reduce the number of welds.

19. A briefcase recorder will record for four hours and will pick up within a sixty-foot radius without an exposed microphone.

20. An electroluminescent lamp is being made for household use. It is a phosphor-coated flat panel without a filament. Its rated life is 10,000 hours.



Power Package

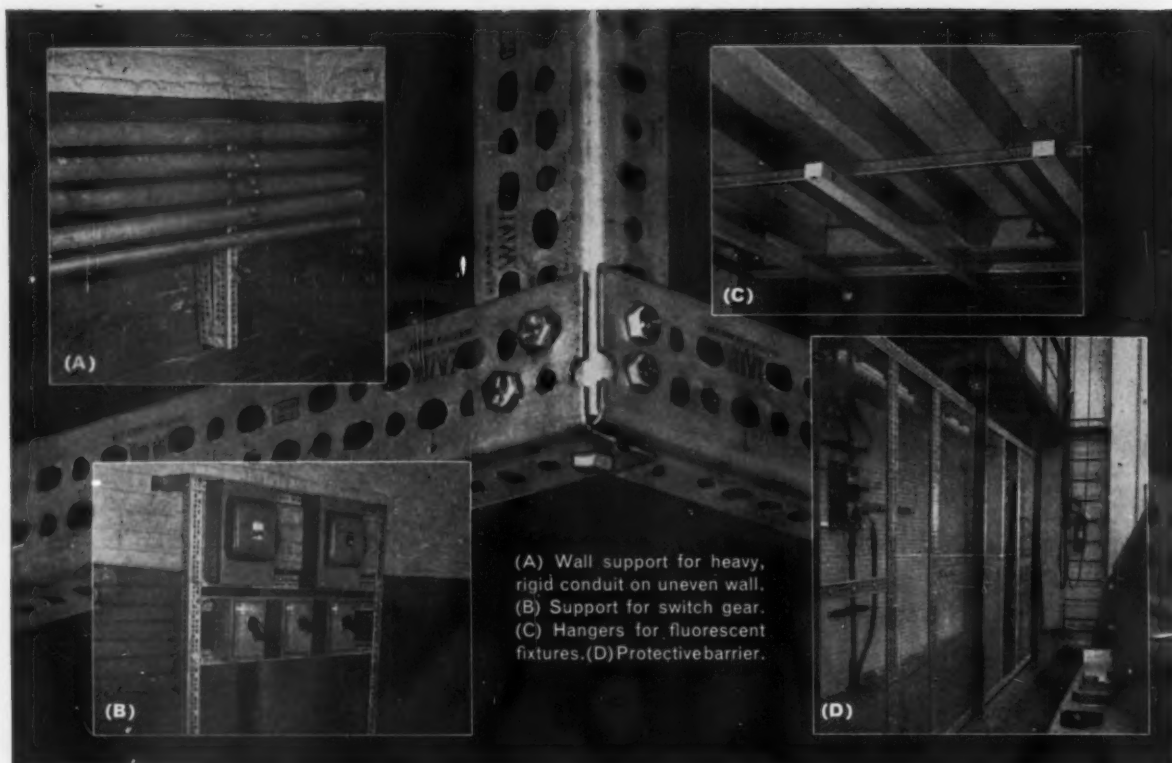
Since its development as a cable insulant in the early 1940's, polyethylene has shown great promise as an excellent high voltage insulation because of its high dielectric strength and low loss factor.

Leading the way in research and manufacturing development, Simplex has overcome the problems inherent in making cables with heavy walls of polyethylene and now regularly quotes and manufactures cables of this type for 5 to 15 kv service. In addition, Simplex has manufactured and will discuss polyethylene-insulated cables for operation up to the 34.5 kv level.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

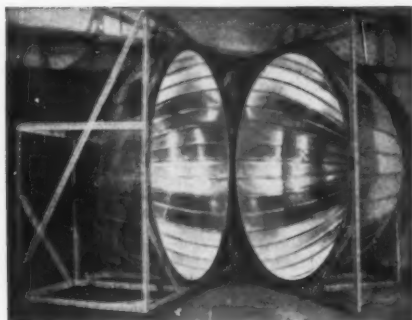


Cut Costs on Any Job with

New

AIM
BRAND

SLOTTED ANGLE



New AIM Brand Slotted Angle is adaptable to all kinds of applications, even such an unusual installation as this street light testing device.

For extra savings on every electrical installation, use versatile, new AIM Brand Slotted Angle—the only framing material that gives you Lock-Joints, Friction-Joints and $\frac{3}{8}$ " structural bolts.

A new, exclusive, slot-and-hole bolting pattern cuts installation costs, provides durable structural assembly and ease of apparatus attachment. Friction-Joints, easily formed by bolting through the slots, offer good rigidity. Bolting through the round holes gives you Lock-Joints for maximum strength and rigidity. All standard electrical fittings adapt to $\frac{3}{8}$ " holes; no reaming or special fittings needed.

Save on installation time, handling and storing. And you make an initial saving on material cost.

Cold-rolled galvanized steel, AIM Brand Slotted Angle is available in two sizes: Standard 225-80 ($2\frac{1}{4}$ " x $1\frac{1}{2}$ " x .080") and Heavy-Duty 300-104 (3 " x $1\frac{1}{2}$ " x .104"). Packaged in 10 pieces of 10 or 12-foot lengths with nuts and bolts.

AIM Brand Slotted Angle is a product of Acme Steel Company, U. S. pioneers in slotted angle framing material. Stocked locally by leading distributors or write: Dept. EBD-49, Fabricated Materials Division, Acme Steel Company, 135th Street and Perry Avenue, Chicago 27, Illinois.

ACME
STEEL

AIM Brand Slotted Angle

AIM
BRAND

Now you can weld a perfect, permanent electrical

SOMETHING REALLY NEW IN LIGHTING!



NEW, SENSATIONAL SELF- SUPPORTING LAMP HOLDER!

Lamp is inserted into plastic tube where base pins snap into socket with 3 lb. grip, giving best possible electrical connection in industry. No support of Lamp is necessary. Socket floats inside tube holder without attachment to fixture.

Mr. Robert Lester, President of TRANSOLITE CORPORATION, holding the new Hot Cathode, slimline U-Tube with snap-in base pins.

The Transolite System is an innovation in lighting and ceiling installation INCOMPARABLE FEATURES:

- HIGH FOOT CANDLES AT LOWEST COST IN INDUSTRY
- SENSATIONAL NEW SNAP-IN SLIMLINE Hot Cathode, 86T12 U-LAMPS, in all colors
- PROVIDES WIDE COVERAGE FROM SINGLE RACEWAY FIXTURE
- NEW 1000 VOLT GENERAL ELECTRIC FLUORESCENT LAMP HOLDERS
- IDENTICAL LAMP SOCKETS ELIMINATE PUSH-SPRING TYPE
- STANDARD WESTINGHOUSE GROOVE-PIN LAMP BASES
- PLUG-IN BALLASTS AND SOCKETS REQUIRE NO WIRING AND CAN CONTAIN EXTRA CIRCUITS FOR CONTINUOUS WIREWAY
- MAINTENANCE IS CUT TO A MINIMUM WITH THIS FIXTURE
- LOW COST SINGLE POINT WIRING INSTALLATION

Tested and approved by U. S. Testing Co., Inc. and Underwriters Laboratories

SEND FOR ILLUSTRATED BROCHURE
developed and manufactured by
TRANSOLITE CORPORATION

550 Fifth Avenue, New York 36, N. Y. • Plaza 7-6620

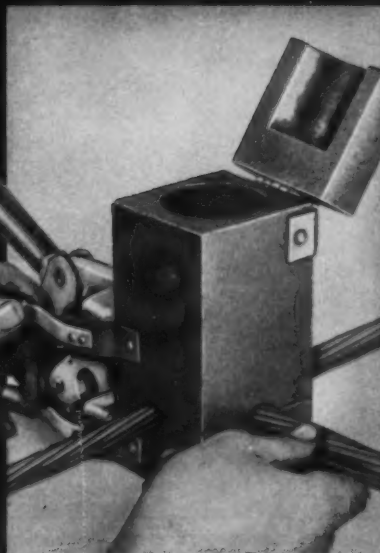
Some Franchised Distributorships available

Now you can weld a perfect, permanent electrical

BURNDY

therm

to any copper conductor or steel



WELD ANYWHERE, TO CABLE OR FLAT, WITH THIS COMPACT, LIGHTWEIGHT THERMOMOLD. Completely self-contained...needs no external source of power, no special skill. Mold fits over conductors, clamps cable in the right position.

JUST POUR WELDING POWDER INTO MOLD, TAP TO RELEASE STARTING CHARGE. Unique composition of starting charge prevents mixing with welding powder, assures positive firing. Exclusive welding powder formula produces easily removed slag.



THERMOWELD
works everytime
— no misfires.

Plastic cartridges have moisture-tight caps. Sealed polyethylene envelope with moisture absorbing silica gel keeps powder perfectly dry. Starting powder won't mix with welding charge, even if cartridges are shipped or stored upside down...full starting charge assures positive ignition of welding powder.

ASK YOUR BURNDY DISTRIBUTOR OR REPRESENTATIVE

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ELECTRICAL

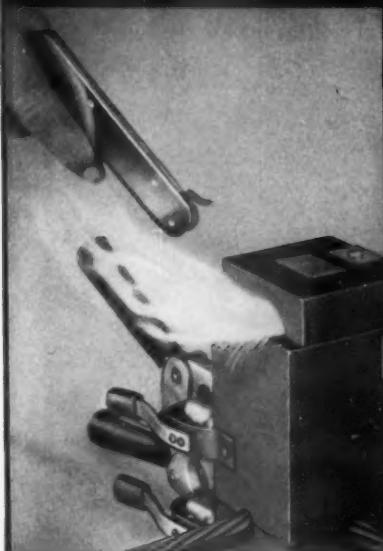
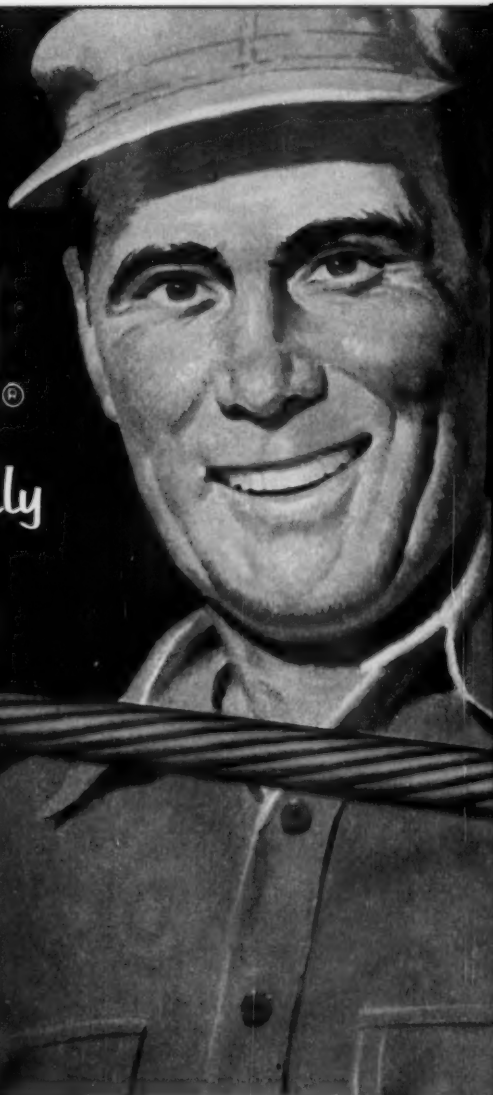
Norwalk, Connect.

In Europe:

connection every time with

© weld®

structure... easily and economically

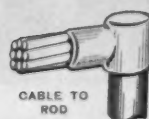
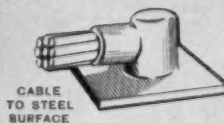


CLOSE COVER AND IGNITE CHARGE WITH FLINT GUN. Fast-burning powder fires every time. THERMOWELD reaction forms liquid, super-heated copper which flows over and around conductors, fusing them into solid copper weld of 100% greater cross-sectional area than cable.



GET A PERFECT, PERMANENT THERMOWELD CONNECTION QUICKLY. Current-carrying capacity greater than conductors themselves. Connection is completely moisture proof, never corrodes or loosens, costs little to install, good for the life of the conductors.

You can THERMOWELD almost all steel or copper connections, including...



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39-5

CONNECTIONS

Antwerp, Belgium

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VERSATILE THERMOWELD

makes cable
— #4 thru
2,000 Mcm
— lug, bus
and flat
surface
connections

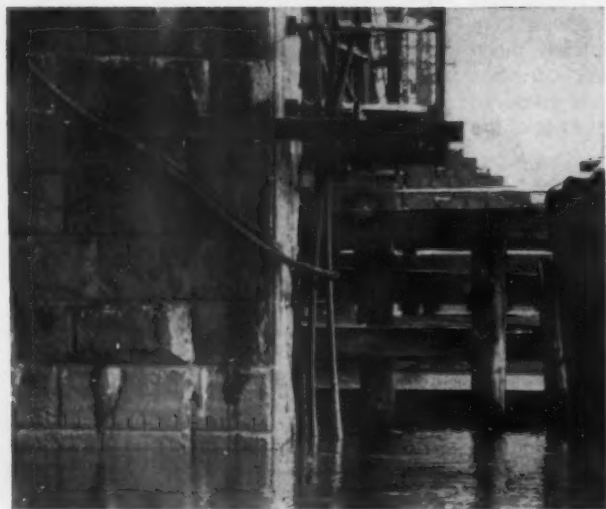
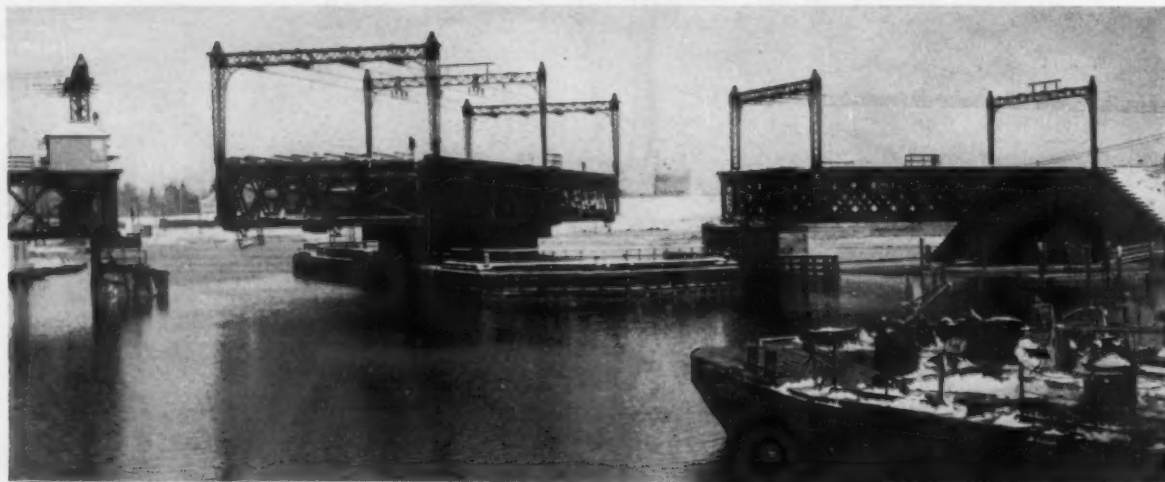
Neoprene jacket protects Simplex cable from salt water

Cable maintenance was a constant problem on 14 movable span bridges of the New York, New Haven and Hartford Railroad. Tidewater corroded the steel armor jacketing on the submarine cables (running from operator's cabin to center pier rotor motor) and eventually led to cable failure.

In 1957, Simplex Wire and Cable Company recommended cable jacketed with DuPont neoprene to replace the original cable on the bridge shown below. The superior construction of the neoprene submarine cable has provided lasting protection from corrosion. In addition, the resilient neoprene sheath protects the cable from damage by floating ice and debris.

On the basis of this performance, the railroad plans ultimately to replace all their armored submarine cable with the neoprene-jacketed construction.

For durability and long-term economy, specify wire and cable jacketed with neoprene. For more about neoprene, write to: E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. EC-4, Wilmington 98, Del.



Better Things for Better Living . . . through Chemistry

SYNTHETIC

RUBBER

NEOPRENE
HYPALON®
VITON™
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WHEELER-FULLERTON * PUTS

HOCKEY IN A NEW LIGHT



63 Wheeler-Fullerton aluminum, deep-bowl, Hi-Bay, 18" reflectors with wire guards. Alzac finish protects reflecting surfaces, resists corrosive atmospheres, repels moisture attack. Ventilating slots for cooling; steel necks for additional strength. Uses 1000 watt incandescent lamps.

50 Wheeler-Fullerton aluminum, deep bowl, Hi-Bay, 14" reflectors with Alzac finish, light the bleachers with 300 watt incandescent lamps.

Intensity of light over ice is 50 foot candles and over goals, 70 foot candles.

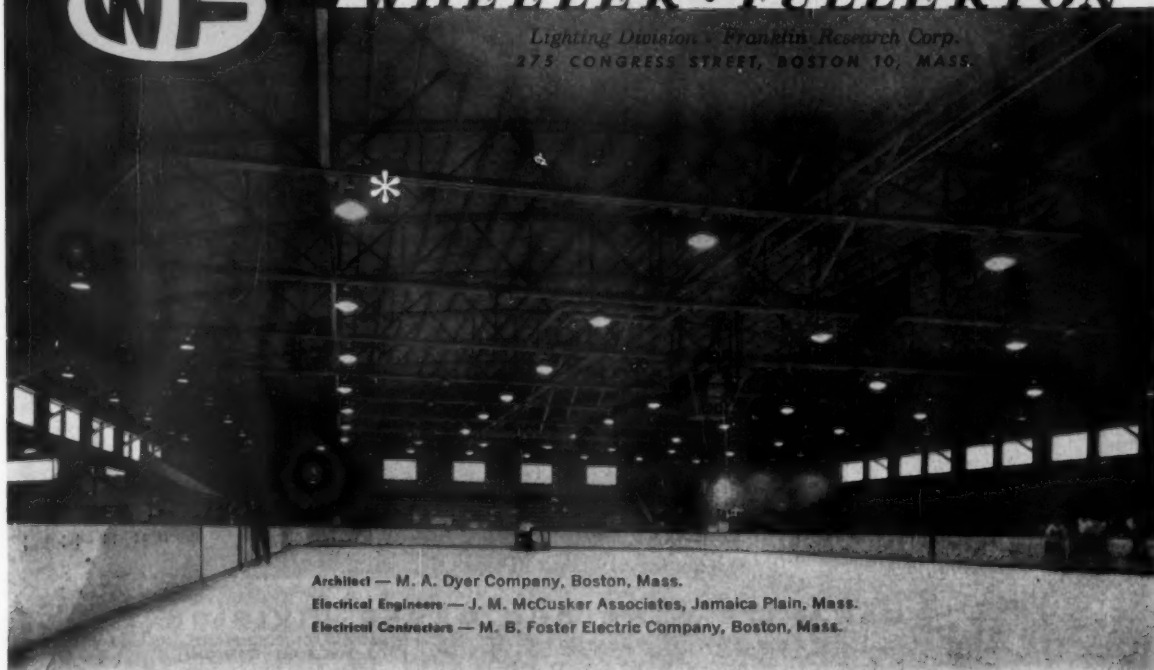
Boston College Rink, McHugh Forum, Highlights Custom Designed Efficiency

In college hockey there's no substitute for top flight performance on the rink, or overhead. The right intensity of light on the right spot, for players and spectators alike, depends on the most careful lighting design and skill of installation. That's why for Boston College, Wheeler-Fullerton easy-maintenance fixtures are the first choice.



WHEELER • FULLERTON

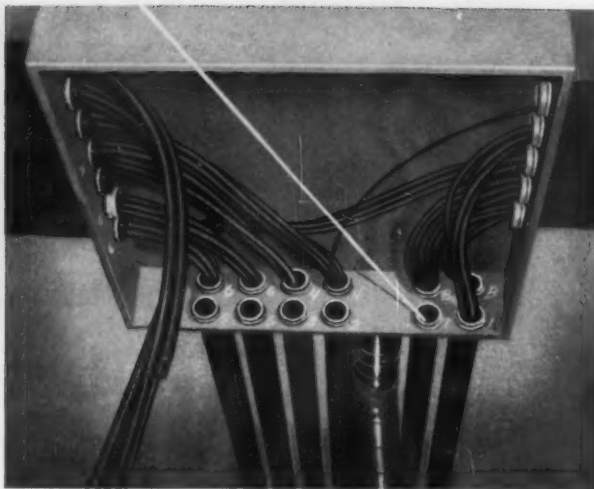
Lighting Division • Franklin Research Corp.
275 CONGRESS STREET, BOSTON 10, MASS.



Architect — M. A. Dyer Company, Boston, Mass.
Electrical Engineers — J. M. McCusker Associates, Jamaica Plain, Mass.
Electrical Contractors — M. B. Foster Electric Company, Boston, Mass.



To meet today's
ever increasing
power demands...



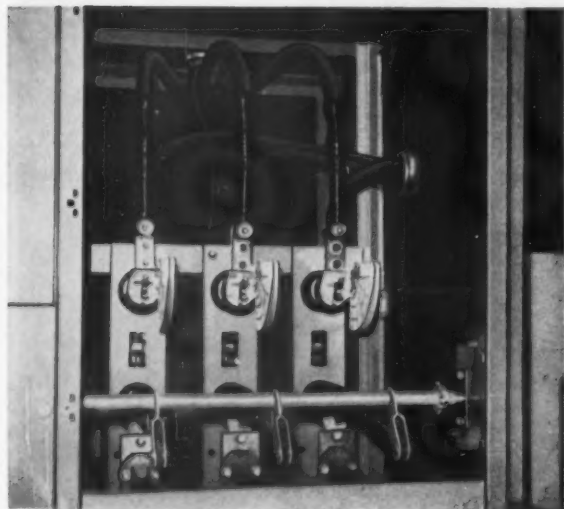
Paronite Paraseal® RHW, Type RR for duct.

IT'S

PARONITE

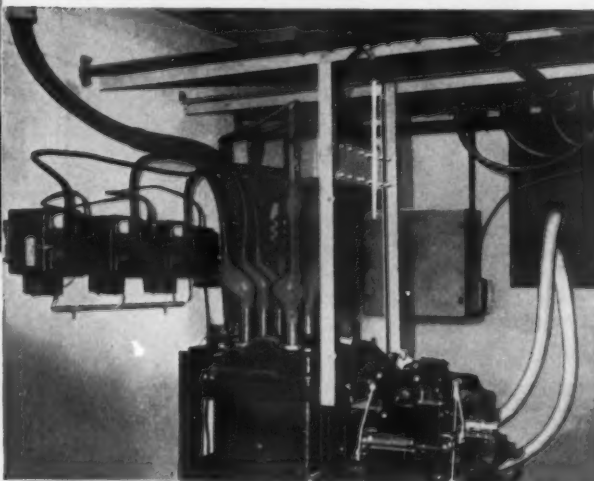
WIRE AND CABLE BEING SPECIFIED

for tomorrow's quality, dependable
and trouble-free installations!



Above: Super Paraseal® RHW, Type RR for direct burial.

Below: Paronite Paraseal® RHW braided, for use in conduit.



Sales Offices in all principal
cities — sold only through
Recognized Electrical
Distributors

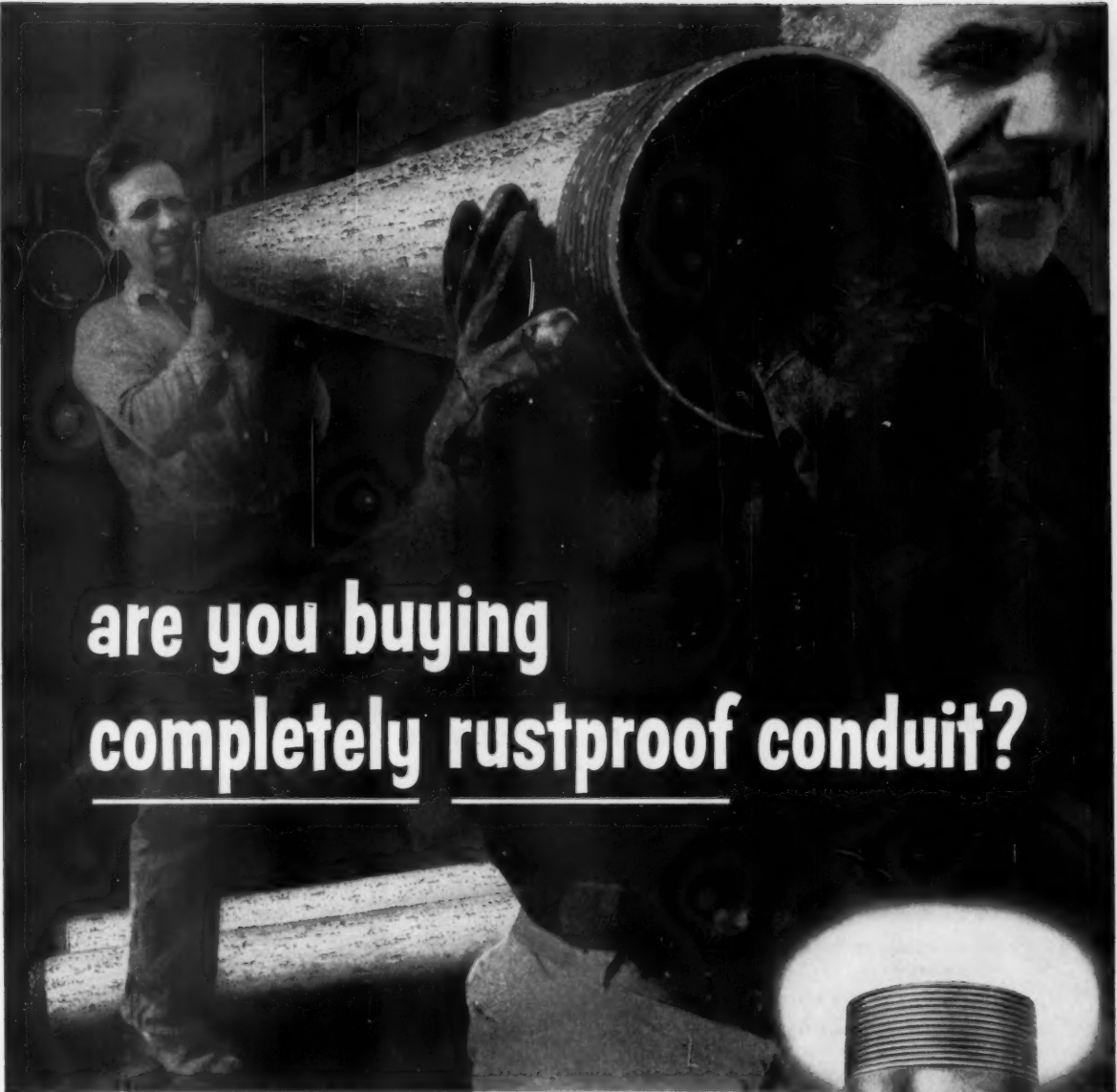


PARONITE WIRE AND CABLE DIVISION

Essex Wire Corporation

FORT WAYNE, INDIANA

MANUFACTURING PLANTS: Marion, Ind.;
Jonesboro, Ind.; Tiffin, Ohio;
Birmingham, Ala.; Anaheim, Calif.



are you buying completely rustproof conduit?

PITTSBURGH STANDARD HOT-DIP GALVANIZED CONDUIT IS RUSTPROOF FROM END TO END


The zinc chromate coating that characterizes Pittsburgh Standard Hot-Dip Galvanized Conduit doubles the protective life of the galvanizing. And the hot-dip galvanized and coated threads stay bright, clean and sharp. No chasing or cleaning required even when conduit lies in storage for months. All thread protectors are color-coded for easy size identification.

For ease in handling, Pittsburgh Standard conduit is banded into master lifts, and the individual bundles of each size are identified by color-coded bundling tapes. All these features are yours at no extra cost when you buy Pittsburgh Standard. Ask for them at your electrical distributor's. *Pittsburgh Standard Conduit Company, Verona, Pa.*

PLANTS AT VERONA AND MORRISVILLE, PA.

RIGID STEEL CONDUIT • ELECTRICAL METALLIC TUBING • ELBOWS • COUPLINGS • FITTINGS

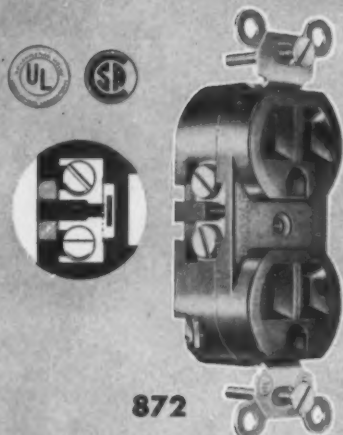
ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . APRIL, 1959



**PITTSBURGH
STANDARD**
CONDUIT CO.

BECAUSE EASY WIRING SAVES INSTALLATION TIME AND MONEY

... Two All-New RODALE Receptacles* With Back Wiring!



Grounded Duplex Receptacle

**... with "break-off" feature
FOR TWO SEPARATE CIRCUITS**

Convenient "break-off" between line terminals permits two-circuit installation—allows for switch control of one outlet, if desired. Rated 15A-125V.

- SPECIFICATION GRADE—meets Federal Specifications—No. WR-00151b
- Plaster ears with convenient break-off type washers
- Takes #14, #12, #10 wire
- Can be used with 2-wire regular or polarized caps

FOR ALL 115V - 125V EQUIPMENT



**Both Feature BACK WIRING
for quick, simple installation**



Grounded Combination Receptacle

**ONE UNIT FOR TWO PIECES
of Electrical Equipment Needing
TWO DIFFERENT VOLTAGES**

One receptacle supplies power both for a piece of 125V equipment (such as a power drill) and for a piece of 250V equipment (an air conditioner, for example). Saves the need for a second box.

- Takes #14, #12, #10 wire
- Plaster ears with convenient break-off type washers
- 125V receptacle can be used with 2-wire regular or polarized caps



***2 more reasons why you'll find ...**

RODALE HAS A COMPLETE LINE OF WIRING DEVICES

For Just About Any Job

*Sold only through electrical wholesalers.
For further information on #872, #772—
or the complete line, write Rodale direct.*



Rodale

manufacturing co., inc.
dept. C4 emmaus, pa.



Balance... the measure of cable superiority

Every brand of cable must have certain important electrical characteristics. But not every brand will have these characteristics in the same relative proportions... and it's this fact that makes a difference in cable life and performance. Look at these significant test results.

	B R A N D			
	CAROL	A	B	C
Electrical Insulation Resistance (1)	100	17	16	68
Cold Bend °F (2)	-50	-45	-90	-50
Abrasion Resistance (1)	91	62	100	92
Ozone Resistance (1)	100	6	18	12

Note: (1) 100 indicates best—others % of best (2) cold bend—actual test temperature

Note how, in Brands A, B and C, there is a marked lack of balance between abrasion resistance and ozone resistance. This means that these cables can crack long before they wear out. Also, it is quickly apparent that needlessly high cold flexibility may be built into a cable...but at the sacrifice of more important electrical properties.

But Carol cable, in addition to having the highest combined rating, is also the best balanced... with primary emphasis on the characteristics most vital to cable life and performance. The balance built into Carol cables is your assurance of superior quality throughout...extra quality and performance where it is most needed.

When you call for cable—call for Carol!



PORTABLE CORDS • POWER SUPPLY CABLE • CONTROL
CABLES • WELDING CABLE • GOVERNMENT TYPES • CORD SETS

Another new development using

B.F. Goodrich Chemical raw materials



"Showplace of the Nation," Radio City Music Hall uses cable insulated with Geon made by Plastic Wire & Cable Corporation, Jewett City, Connecticut. B.F. Goodrich Chemical Company supplies the Geon polyvinyl materials only.

Cable at Radio City Music Hall gets lighter touch from Geon

Changes in electrical setups backstage during shows at Radio City Music Hall were a problem because the electrical cable was so heavy—it took two men to lift a 100-ft. length. Now a new cable insulated with Geon polyvinyl material solves the problem—it is so light that one man can easily lift a 100-ft. coil.

In addition to being lighter, cable insulated with Geon is considerably reduced in bulk, making it easier for the set designer because it is ideal for hook-ups to lightweight backdrops. Geon-insulated cable lies flat, too, unlike old-style cable. It is excellent for use in traffic areas—like stages.

In a place where many people gather, safety is also a primary consideration. Again Geon scores—because it has excellent dielectric properties. Inspection authorities have approved. There are no braids to rot, or to wick moisture. There is no lead sheathing to corrode. And this insulation of Geon is strong, fire-resistant (will not support combustion), and has good flexing properties.

Here's another way Geon polyvinyl material is providing the key to new product applications. You can get more information by writing Dept. AU-1, B.F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15,

Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



B.F. Goodrich Chemical Company
a division of The B.F. Goodrich Company



GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

NOW!

ALL WITH DOORS

*...panelbase
assemblies for
12, 20, 30 & 42 circuits*

FRANK ADAM LOAD CENTERS

With these new ® Load Centers—with space for 12, 20, 30, or 42 single-pole circuits—you can reduce wiring time, cut equipment cost and furnish a much better, more compact installation.

Doors are now standard on all Frank Adam Load Centers, from 12 to 42 branches. Conceals branch circuits—protects them from possible damage—helps discourage unauthorized use—makes a neater, more attractive installation.

Immediate Delivery From Your Wholesaler

All contacts and bus bars heavily electro silver plated. One-piece galvanized enclosures, roomy gutters ALL sides, plenty of knockouts. Sequence bussing permits any pair of single-pole breakers to be made into double-pole with handle extension. Panel-base adjustable for flush or surface mounting. UL approved for label service.



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in SWEET'S



QP QUICKLAG-P CIRCUIT BREAKERS

*... most dependable, safe
circuit protection made*

Thermal magnetic—quick-make, quick-break. Trip-free handle prohibits handle from being held closed on overloads and shorts. Time lag feature prevents tripping on momentary harmless overloads.



CAPACITIES: 10, 15, 20, 30, 40 and 50 amps. 2-pole and 3-pole common trip breakers available.

For a gentle
chime...
a blasting horn
...or a complete
audio-visual
system

IN COMMUNICATIONS SEE *Sperti Faraday*

Whatever your problem, simple or complex, our engineers assist in designing the system that best suits your needs. Simply call your nearest Sperti Faraday representative or write Sperti Faraday, Inc., Adrian, Michigan. In Canada, write Sperti Faraday, Ltd., Montreal.

Specialists in: FIRE ALARM SYSTEMS • COMPLETE CLOCK SYSTEMS • HOSPITAL SYSTEMS • PATIENT OBSERVATION (CLOSED CIRCUIT TV) • AUDIBLE SIGNALS • ANNUNCIATORS • CODED PAGING SYSTEM • SYNCHRONOUS CLOCKS • TRANSFORMERS • CONTACT DEVICES



Sperti-Faraday installations include Rockefeller Center, Waldorf-Astoria Hotel, Hotel Astor, Hotel Lexington, Walter Reed Hospital, Johns Hopkins Hospital and many others.

*Sperti
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ADRIAN, MICHIGAN

SINCE 1875 DESIGNERS AND PRODUCERS
OF VISUAL AND AUDIBLE SIGNALS



VIBRATING BELLS
Cat. No. 2060



VISACALL
Closed Circuit TV For Supervision
of Hospital Patients Visacall-4



AC UNI-FACT HORNS
Cat. No. 121-U Megaphone
Projector



NODE MASTER
Page-Boy of your Organization
Cat. No. 805



*the size,
type,
rating,
quality...*

Illustration, above, shows size relationship of a Hubbell 4-wire, 50 amp. "Twist-Lock" cap and a midget 2-wire, 10 amp. "Twist-Lock" cap... a good indication of the wide range of sizes and ratings available.

Twist-Lock®

...for every purpose

"Twist-Lock", first and still the finest locking connector made, is designed for portable electrical equipment requiring constant contact pressure and safe, secure locking protection and convenience. It is ruggedly constructed to withstand abuse and provide long life service. "Twist-Lock" offers many wiring features which simplify installation and eliminate costly service call-backs.

8 DIFFERENT LINES

"Twist-Lock" represents the safest and most complete quality line of locking connectors ever developed. Caps, connector bodies, motor bases and receptacles are available in the eight different types and sizes shown at right, and in ratings to conform to your electrical specifications.

Every cap and connector body from 10 amp. to 50 amp. is now available with "Seal-Tite" rubber covers for weather-proofing purposes, protection from dust and dirt or from hard knocks and rough usage.

HARVEY HUBBELL, INCORPORATED
BRIDGEPORT 2, CONNECTICUT • IN CANADA: SCARBOROUGH, ONTARIO

REGULAR *Twist-Lock*

Rugged construction. Regular wiring. Wide range of types and ratings.

SUPER *Twist-Lock*

Screwless terminals and dead front for faster, safer wiring.

MIDGET *Twist-Lock*

The same high quality in midget size. Many O.E.M. uses. Wide selection of types and ratings.

GROUNDING *Twist-Lock*

For 125 v. grounding only. Non-interchangeable with regular "Twist-Lock".

"INSULPRENE" *Twist-Lock*

Tough neoprene compound resists steam, hot water, grease, acids, etc.

30 AMP. SUPER *Twist-Lock*

Non-interchangeable with 20 amp. units. Prevents interchange between 20 and 30 amp. service. Screwless terminals and dead front.

50 AMPERE *Twist-Lock*


In 600 v. A.C. and 250 v. D.C. Solderless connections. Metal cord grips.

277 VOLT *Twist-Lock*

Non-interchangeable with other "Twist-Lock" or any other device made. Used for fluorescent lighting.

For contractors who want the finest . . .

Phelps Dodge Habirite-Habirprene Cable with Wire Shield!



Phelps Dodge pioneered the use of a wire shield as a standard item in power cable construction. From this background and experience, Phelps Dodge developed its outstanding Habirite-Habirprene high voltage cable with a wire shield. This cable offers a number of advantages over ordinary "RR" cable with tape shield including:

1. Greater flexibility; minimum bending radius in most cases is less than half the bending radius of tape-shielded cable, making installation easier in confined areas.
2. Rugged wire shield can be braided or bunched for use as a ground lead at splices and terminations. Intermediate steps in making ground connections are eliminated, saving time and effort.
3. Dependable wire shield continuity provides protection against hidden shield rupture which can occur during installation or in service.
4. Overall wire shield resistance is constant without the variations found in tape-shielded cable.

Habirite-Habirprene cable with a wire shield assures you the utmost in safety, durability and handling ease.

See your Phelps Dodge Distributor!

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CORPORATION**

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SALES OFFICES: Atlanta, Birmingham, Ala., Cambridge, Mass., Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Fort Wayne, Greensboro, N.C., Houston, Indianapolis, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N.Y., San Francisco, St. Louis, Seattle, Washington, D.C.

Power Packed Programs

Industry campaigns backing up residential electrification will be supported this year by an unprecedented outlay for advertising and sales promotion. "Housepower", "Live Better Electrically", "Medallion Homes", and the new "Light for Living" programs, previewed at the National Wiring Conference in New Orleans last month, promise that powerful and spectacular messages will reach home owners and builders everywhere, creating new demands for modern wiring, appliances and lighting.

Add to these giant projects, the recently announced "Total Electric Home" promotion, plus a number of other manufacture-sponsored activities and the supporting promotion on the national level for local sales is greater than any builder program ever conceived in this country by any industry.

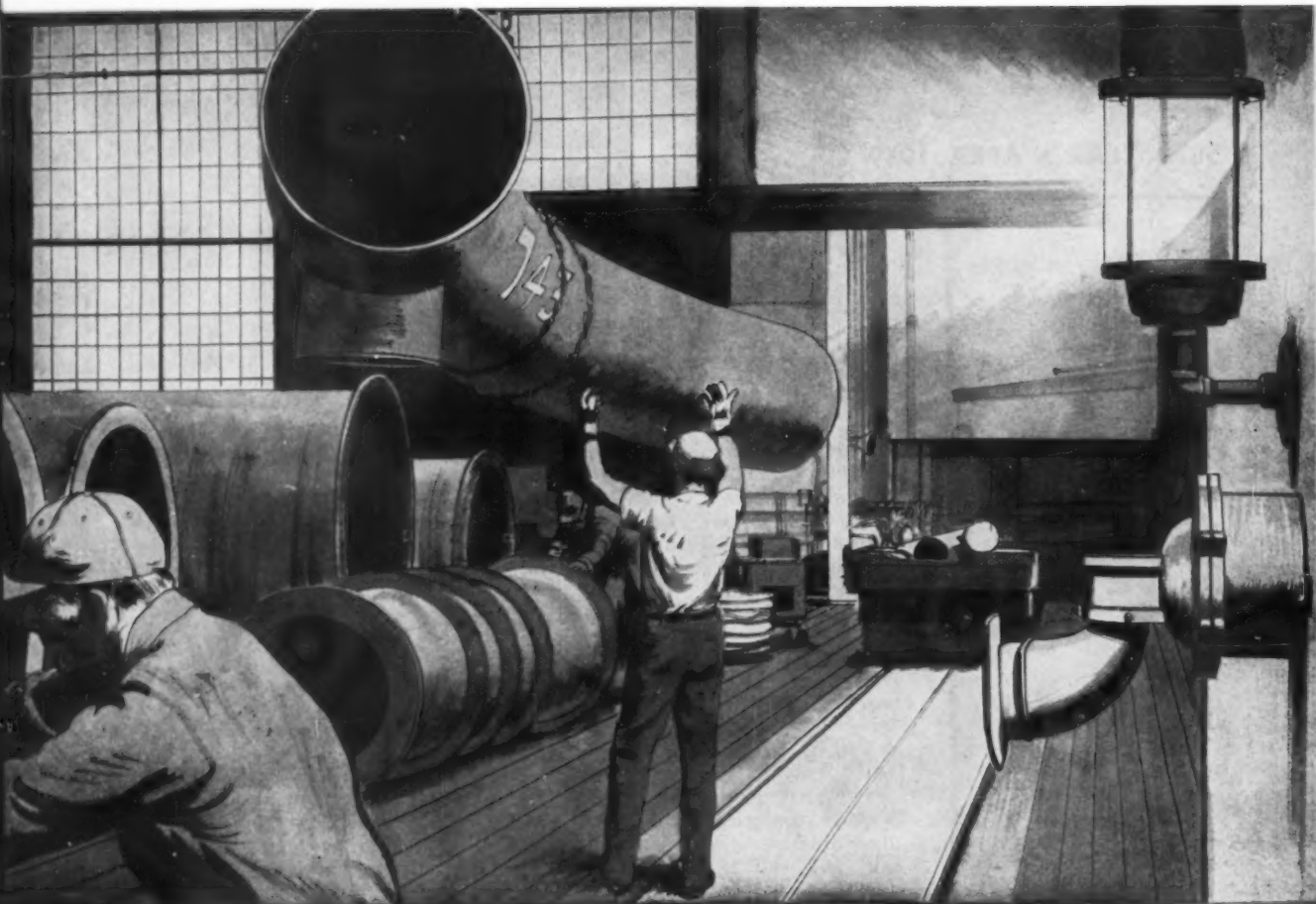
For electrical contractors active in residential wiring and residential electrical modernization, the opportunities for solid, profitable business are virtually unlimited. Huge segments of the high-powered promotions are directing customers straight to his doorstep—as the Housepower specialist and the dealer for contractor-installed electrical equipment.

With opportunity comes, inevitably, responsibility. National advertising will inspire popular interest and will bring the customer to the contractor. He can carry the sale through to the customer's enthusiastic satisfaction and his own ample reward—if he will take the trouble to keep informed and be ready to deal constructively and understandingly with the questions that prospects will bring to him. And, of course, the same rule holds for every one of his employees who is in contact with the public.

Close identification with the national programs is of the utmost importance. Truck decals, window displays, business cards, letterheads, and advertising should carry the program symbols. The "Housepower Rating" and "Housepower Estimate-Proposal" forms should be used. Each of these devices is not only useful to the contractor but are continuing reassurances to the customer that he is following the right procedure to obtain what the advertising offers.

The power-packed promotion programs for 1959 are going to produce business for the electrical contractor right in his own backyard. And his effective participation is a keystone role that can ultimately decide the success or failure of millions of dollars worth of advertising and sales promotion. The stakes are high. The market potential is measurable in billions of dollars. It's big business and deserves alert attention and smart organization by progressive electrical contractors to carry through sales and installations at the customer level with a high order of professional skill and responsibility.

Wm. T. Stuart



Your customers may need audible and/or visual signaling facilities for paging or warning. They may need intercom for a dozen different industrial conditions. You can meet every signaling need by calling Graybar.

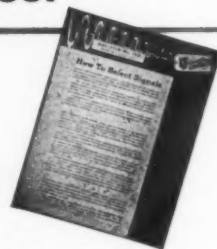
How to plan **SIGNALING** that will **LOCATE — WARN — PHONE** anyone, anywhere in the plant—or out

New construction, additions or modernization may confront you with signaling problems. By calling *Graybar first*, you'll get the facts on the newest and finest developments of such leaders as **USI** on sound powered telephone; **Edwards** code-paging and calling systems; **Webster** intercom, **Federal** signals and **Sperti Faraday** annunciators and clocks for every usual and specialized condition.

Calling Graybar enables you to fill *every* signal need from *one single, convenient source*. Your Graybar Signaling Specialists make it their business to know the special advantages of all the latest equipment.

Remember, too, that Graybar distributes *everything electrical* for wiring, lighting, power and ventilation.

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Everyone who plans, uses or installs signaling equipment can use a copy of this free Signaling Selection Guide, produced by the Federal Sign and Signal Corporation. If you are located in the U. S. or possessions, write for your copy.

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GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK. IN OVER 130 PRINCIPAL CITIES

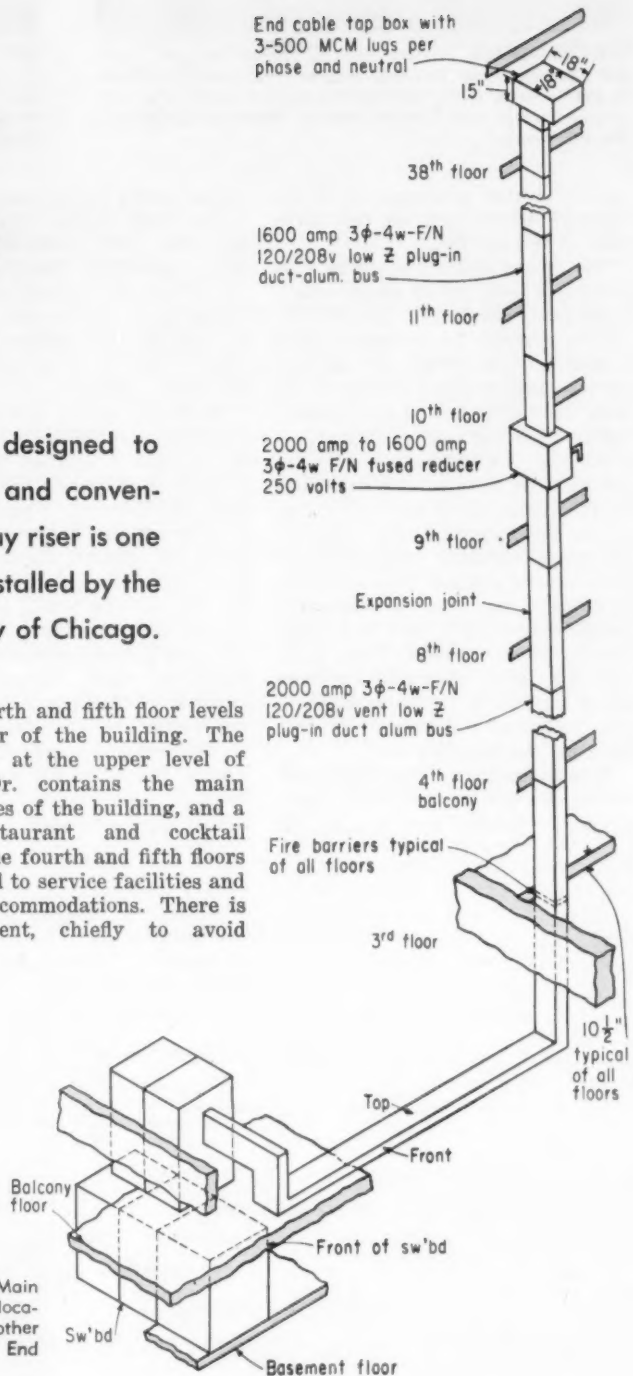
Wiring Chicago's Executive House

The new 40-story apartment-hotel is designed to reflect the latest in comfort, efficiency, and convenience. A high-capacity aluminum busway riser is one of the features of the electrical system installed by the Goldberg and O'Brien Electric Company of Chicago.

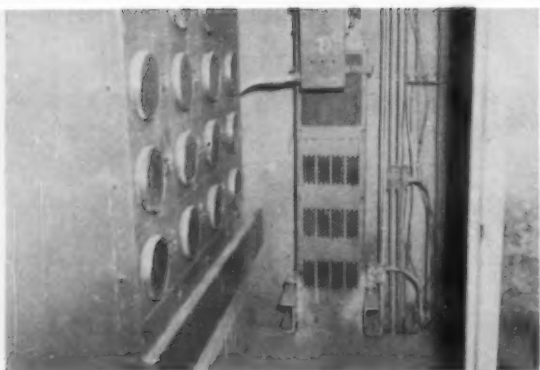
CHICAGO'S newest hotel in 28 years, the Executive House, becomes the most recent addition to the city's skyline. Located just north of the Loop (business district) on Wacker Dr., the \$7 million, 40-story building contains a number of bold and unique designs and construction features. Rising to a height of 371 ft above ground level, the reinforced concrete structure (believed to be the tallest such building in the U. S.) displays a gleaming exterior brought about by the successful blending of glass and stainless steel.

The first floor of the building is at the lower level of Wacker Dr. Parking for 203 cars is provided on the first and second floors, and

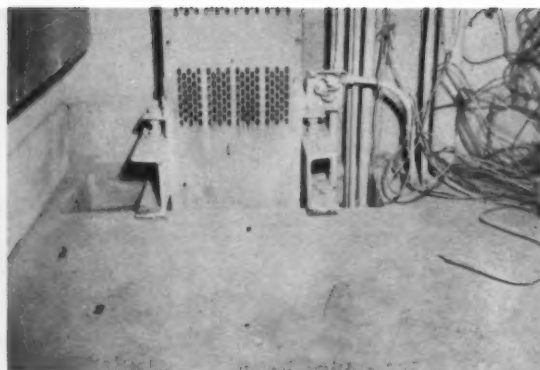
on the fourth and fifth floor levels at the rear of the building. The third floor at the upper level of Wacker Dr. contains the main lobby, offices of the building, and a large restaurant and cocktail lounge. The fourth and fifth floors are devoted to service facilities and parking accommodations. There is no basement, chiefly to avoid



BUSDUCT RISER LAYOUT. Important features: A. Main switchgear and busduct take-off cabinet. B. Fire barrier locations (typical of all floors). C. Expansion joint (typical of other floors). D. Fused reducer (typical of other locations). E. End cable tap-box at 38th floor level. (Fig. 1)



HIGH-AMPERAGE busduct riser is tapped in each floor's electrical closet by 100-amp plug-in type busduct switches. A short 1 1/4-in. feeder connects the plug-in switch to a combination meter and breaker housing especially constructed for the project.



STEEL HANGERS attached to busduct lengths are bolted to pieces of 6-in. by 3-in. steel channeling. Two pieces of channeling (one on each side of the busduct) bridge each floor's rectangular opening to support the weight of the busduct sections floor by floor.

ground water problems from the Chicago River, just on the north side of Wacker Dr.

There are 442 rental units containing a total of 508 rooms. Each floor from the 7th to the 38th inclusive contains 14 apartments. The 39th floor is devoted to a Solarium, cocktail lounge and restaurant; the 40th floor will be used as an observation deck and roof garden.

Nearly three-fourths of the rental units have private balconies, 6 1/2 ft wide by 20 ft long. The four center units on each floor have no balconies, meaning that their exterior walls are set flush with the building lines. This arrangement provides space for four passenger elevators on one side of the main corridor, with stairwells, storage areas, and ducts for service facilities, including a 2000-amp busduct riser on the opposite side.

Rental units in the Executive House are divided into two classifications—studios and suites. All

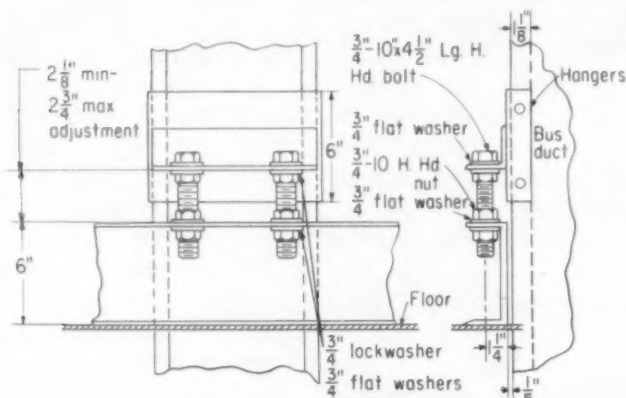
suites have a living room and a bedroom. Both studios and suites are equipped with complete kitchenettes, providing cooking facilities for all guests. Approximately 20% of the hotel's studios and suites will be rented on a permanent basis. About 80% will be reserved for transient guests.

With this rather brief review of the hotel's overall facilities in mind, let us take a detailed look at the attributes of its electrical system. The 120/208-volt, 3-phase, 4-wire service for the building is tapped from the utility's network system at a vault located in the alley at the rear of the hotel. Nine 100-ft runs of 4-in. conduit proceed from the vault to terminate at a main distribution board housed on the lower level of the building. Six of the conduits each contain three 500 MCM conductors and one 4/0 conductor. Three of the conduits are spares. The main distribution switchboard contains a 5000-amp

main switch with high-capacity fuses, current transformers for master metering, and an attached cabinet for busduct riser take-off.

The high-amperage 120/208-volt, plug-in, aluminum busway feeder proceeds horizontally from the main switchgear to a point of vertical ascent incorporated into the building design to provide space for all service duct risers. The busduct climbs from the third to the 38th floor through rectangular openings on each floor. The openings were provided by wooden forms set in place before concrete pour was started. Generally speaking, the busway sections were delivered to the job in 8-ft lengths (ceiling height of each floor). And since the riser was to be installed from the ground up (following the overall building construction pattern), shipping sequence of the busway was arranged from the switchboard on. This enabled electricians to install the lengths as they arrived, or as they were needed to keep pace with construction progress. Chain-falls were used to lift each section in place floor by floor. At each floor's apartment metering room, two sections of the duct are joined together directly below the room's ceiling line.

Supporting the busway as it rises to a 38th-floor level could have posed a major problem. But the task was made relatively simple by equipping each riser section with two vertical side hangers. The steel hangers are attached to the busduct sections approximately 9 ins. above floor level. Four (two on each side) 3/4-in. bolts with double locknuts are used to bolt the hangers to supporting pieces of 6-in. by 3-in. steel channeling that bridge the floor openings on each side of the bus-



Typical Vertical Hanger

DETAILS of method used to supply floor by floor support for busduct feeder as it rises to a 38th floor level. (Fig. 2)



SEMI-FLUSH heating and cooling units thermostatically controlled provide year-round comfort for hotel's guests. Cooling is provided by a central chilled water system. Hot water is used for heating. Double squirrel-cage blowers built into each unit help to circulate the hot or cold air.



WORKMEN are shown connecting two conduit feeders that run from the end of the busduct riser on the 38th floor to elevator control panel located in penthouse.

duct sections (see Fig. 1). This means that the weight of each length of busway is individually supported floor by floor.

Since voltage drop is of prime importance in any high-rise busway installation, this was one of the major factors towards determining size and capacity of the system. The sections of bus installed between the third and ninth floors consist of bus lengths designed for 2000 amps. At the tenth floor, a 2000-amp to 1600-amp, 3-phase, 4-wire fused reducer changes the capacity of the bus sections to 1600 amps. The 1600-amp capacity is then carried through all floors from the tenth to the 31st floor. At this point bus capacity is again reduced, from 1600 amps to 1000 amps with the same type of built-in fused reducer used at the tenth floor level. Busway sections of 1000-amp capacity finish out the run between the 32nd and 38th floors.

The ventilated, low-impedance busway system contains fire barriers between each floor and has expansion joints between the eighth and ninth, and the 24th and 25th floors. An end cable tap box 18 by 18 by 15 ins. is mounted at the end

of the busduct run on the 38th floor. Two 3-in. conduits rise from this point to feed elevator controls in a penthouse atop the 40th floor.

The busway system is tapped at each floor's electrical closet by 100-amp, 3-pole, 4-wire, 240-volt plug-in type busway switches. A short 1½-in. feeder connects each plug-in switch to a metal surface housing especially constructed for the project. The housings each contain 14 socket-type meters mounted in four banks of 2, 4, 4, and 4. Each of the housing's 14 meters are fed from a wireway located at the bottom of the units. Flush-mounted circuit breakers built into the housings directly opposite each meter provide overcurrent protection for apartment circuits. One 20-amp appliance circuit and one 15-amp lighting circuit are provided for the smaller apartments. The larger apartments have one 20-amp appliance circuit and two 15-amp lighting circuits. When rental units are leased on a yearly basis, the tenant pays his own electric bill. Meters for rooms rented by transient guests are jumpered. Home runs from the apartment are carried by ½-in. EMT to the combination meter

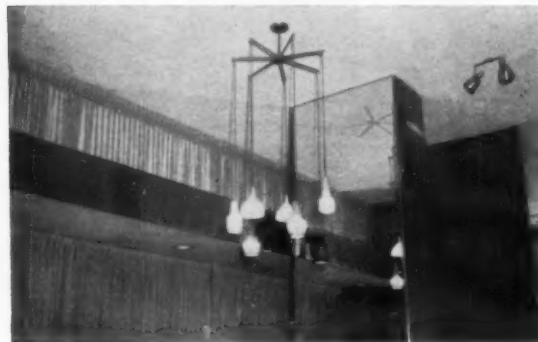
and breaker housing installed in each floor's electrical closet. The runs are concealed in floor slabs that consist of 2½ ins. of concrete poured on top of 8-in. lightweight pre-cast concrete blocks.

The apartment-hotel building employs a combined heating and cooling system. Individual semi-flush room units thermostatically controlled provide year-round comfort for all guests. Two large centrifugal refrigeration compressors with a total capacity of 300 tons serve the air conditioning. Hot water is used for heating. Each room unit, besides being thermostat-controlled, has a built-in squirrel-cage blower to help circulate the hot or cold air. A separate 25-ton unit is installed to cool the lobby.

A special telephone switchboard is installed that permits guests to dial all local, suburban and long distance calls directly, without contacting the hotel switchboard.

The four automatic passenger elevators are operated by two 58-hp motors and two 25-hp motors. The automobile elevator at the rear of the building uses two 50-hp motors.

DECORATIVE INCANDESCENT LIGHTING UNITS such as the one pictured here are used to provide unique lighting effects for the hotel's lobby. Overall lighting arrangements for the lobby's modern atmosphere consist of a combination of surface incandescent, recessed, and luminous ceiling.



ROW OF CEILING PANELS above entrance to four passenger elevators "light the way". Adjacent recessed units in dropped ceiling give warm tones to coloring of walls, furniture and planters.



A Preview of

Motor Shops in

THE NISA annual convention in Montreal, Quebec, on May 17-20 will be the first held outside the continental limits of the United States.

After a welcome of NISA president-elect H. C. Blenkorn, Blenkorn and Sawle, Ltd., St. Catherines, Ontario, and an opening address by J. Herbert Smith, president, Canadian General Electric Co., Toronto, Ontario, the program calls for four days of discussion on large motor and transformer servicing, insulating materials, magnet wire developments, shop management, advertising, and salesmanship. "Shop talk"

discussion groups with panels presiding, always a popular feature, will occupy two afternoons. A dinner-dance, complete program for women guests, and a tour of electrical equipment service shops in the Montreal area—several of which are pictured on the following pages—will round out the convention activities.

General convention chairman is D. D. Bishop, president, Montreal Armature Works; C. J. Ainsworth, Ainsworth Electric Co., Ltd., Toronto, is program chairman.

Leduc Electrical Ltd., Montreal



VARNISH is applied to large stator windings using pitcher. Excess runs into large funnel and is collected in second pitcher. Method gives maximum control over "dipping" process without danger of contaminating windings.



PRONY BRAKE mounted on bench, shown here being used to test a 1 1/2-hp repulsion-induction single-phase motor, provides means of measuring starting torque of small motors. Bench-mounted gage is easily read by operator.



WINDING MACHINES are located in separate area adjacent to service benches. Small "mush" coil is being wound here. Insulating materials are stored in out-of-the-way cabinets above benches.



MACHINE SHOP area includes four lathes ranging in size from 10 to 21 in., plus drill presses and miscellaneous smaller machine tools for the many and varied tasks encountered.



ELECTRIC WELDING equipment is contained in booth with overhead exhaust to draw off fumes. Side plates, shown here removed, normally shield arc from remainder of shop.



SHUTTERED DOORS and narrow wall opening for hoist permit equipment to be moved in and out of the shop without exposing interior to cold for more than a few seconds.

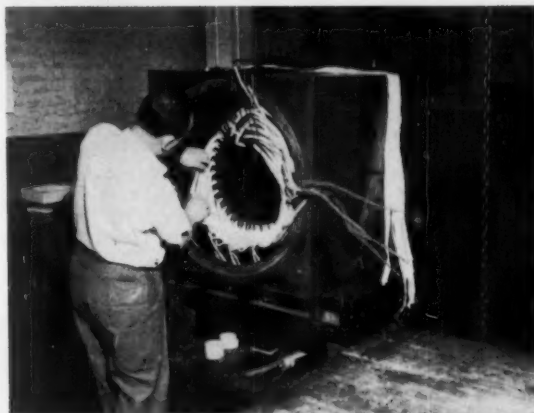
Montreal

The 1959 National Industrial Service Association Convention to be held May 17-20 in Montreal. Here is a quick look at some of the operations and equipment typifying the shops in the area.

Montreal Armature Works, Montreal



FREQUENCY CONVERTER coils are typical of large equipment handled regularly in the shop. Rod-type hangers provide convenient storage for coils until needed.



HIGH-FREQUENCY generator used for induction furnace is being fitted with new stator winding in this photo. Chain hoists facilitate movement through shop.

Lalonde Electric, Montreal

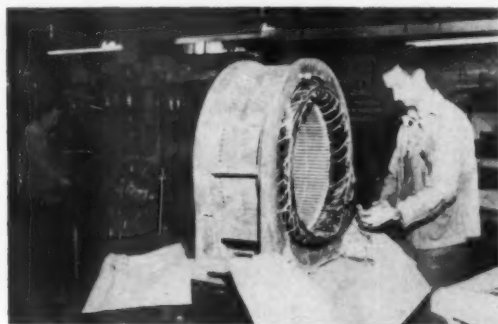


MACHINE SHOP occupies half of basement area in this two-floor shop. Lathes find frequent use in turning down shafts and commutators.



DIP TANK in foreground is used for large equipment. Infra-red baking oven in background was designed and built by owner Guil Lalonde.

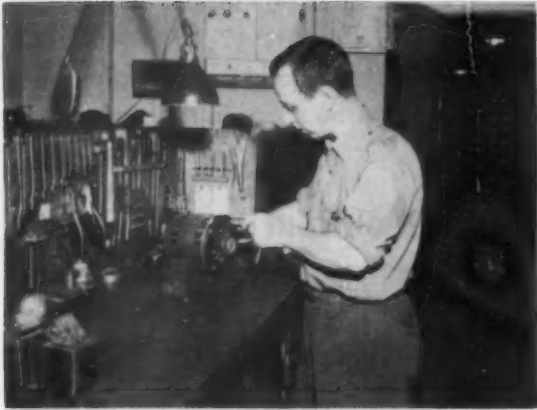
SPECIAL COMPOUND has been developed by the shop to protect motor windings against corrosion. Coil ends of this 35-hp mine motor will be coated after winding.



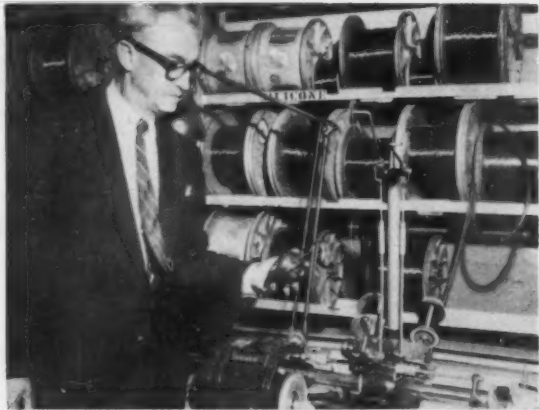
PARTS INVENTORY for standard-make motors plus general electrical supplies are kept in drawers behind counter of sales room.



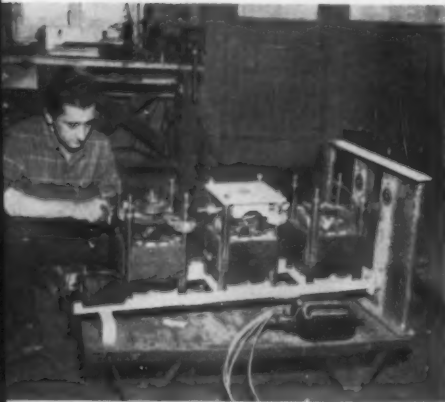
H. Roberge, Inc., Quebec City



INDIVIDUAL BENCH with complete set of tools is supplied for each employee in fractional motor department. Time saved chasing down tools ups efficiency.



MAGNET WIRE stock, one of largest in North America, is shelved in winding department. Owner Hector Roberge checks completed contactor coil.



FABRICATED EQUIPMENT turned out by the shop is typified by this 3-phase voltage regulator constructed for a Canadian paper mill, shown here getting a final check-out.



PARTS STOCK kept by this 23-year-old firm is one of most complete in Canada or United States. To insure strict control, only one employee is permitted to requisition parts or place them in stock.



HYDRAULIC PRESS bed was extended from 8 ins. to 30 ins., winning an award in a recent NISA competition.

Harbour Electric Ltd., Montreal



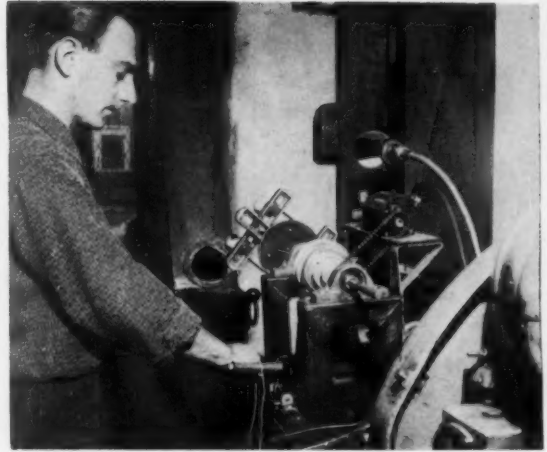
BLUEPRINTS of construction job aboard ship in nearby harbor are checked by owner Gerard Lefebvre (left) and estimator Bernard Courville. The firm anticipates increased marine service and construction business with the opening of the enlarged St. Lawrence Seaway.

"M" Electrique, Trois Rivières



WINDING DEPARTMENT includes two winding heads and a taping machine. Operated by Paul Mongrain and Charles Methot, both former trade school instructors, the shop services many of the country's largest paper mills.

Donat Piette, Joilette

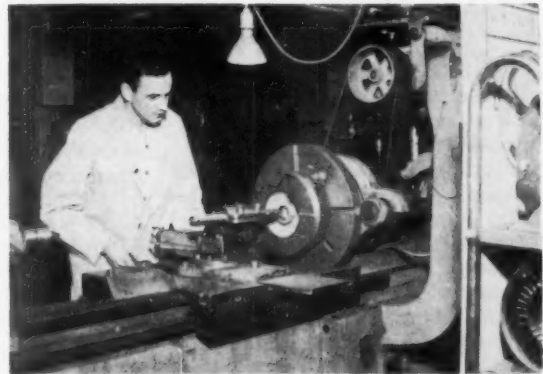


SHOP FOREMAN Andre Joly operates coil-winding machine designed and built by general manager Marcel Piette. Machine has a total of 12 speed combinations. Area served by shop includes grain, textile, tobacco and agricultural industries.

J. H. Sauve et Fils, Valleyfield



OWNER J. H. SAUVE, who operates the firm with sons Gerry and Rene, confines his activities to designing and counseling.



LATHE RIG for truing up end bells was designed by Rene Sauve, shown here at lathe.



DIP TANKS are served by hoist system which runs in a loop from entrance about shop interior.



HANDLING is reduced by hoist system, which permits direct loading of equipment on trucks.



WIRE SPOOLS are mounted on metal rods in winding area so that any size or type wire may be hooked up to winding machines. Shop accounts include chemical, textile, paper and medical supplies manufacturers, quarries and distilleries.

Electric Ceiling Installation

A roundup of practical job techniques used by United Lighting and Ceiling Co. of Oakland, Calif.



LUMINOUS CEILING in California engineering office, covering more than two acres, involved practice of numerous practical methods, including use of special work benches, scaffolds and jigs.

WHEREVER installation details are repetitive, as is the case on most sizable electrical jobs, probabilities are that mass-assembly or prefabrication can provide efficient shortcuts to completion. That is, wider margins of profit oftentimes can be realized through judicious use of templates, jigs, power tools, unique procedures for accomplishing routine details or variations in standard designing.

This premise is effectively illustrated by several practical job methods related to the installation of a 90,000-sq-ft luminous ceiling in an engineering building at Hawthorne, Calif. Installed by the United Lighting and Ceiling Co. of Oakland for Northrup Aircraft, the project included 4300 8-ft slimline lamps—over six and one-half miles of linear light. Translated into related components and repeated operations, this job presented a fine opportunity for conserving time and energy by adopting good job techniques.

As a starter, United first considered the relatively minor problem of transferring material from delivery trucks to the interior second-floor jobsite. And, as a solution, it was decided to use an inclined continuous-belt motorized conveyor to

carry cartons from truck tailboards to upper-floor windows.

As noted in an accompanying photo, the conveyor is supported by a horizontal frame placed on the ground and properly leveled. It will also be noted that the belt-supporting truss is raised to the desired angle by means of a movable, pivoted section equipped with rollers on its outboard or upper end and a cable-sheave arrangement linking this end with the conveyor's drive motor. With the use of a clutch, this motor gives double duty by pulling the pivoted frame inwards, thereby causing the rollers to slide down the underside of the truss assembly and raise the far end of the conveyor to the desired elevation.

With this rig in place, unloading of trucks consisted merely in lowering tailgates and sliding cartons onto the continuously-moving belt. As cartons reached upper windows, they were removed and stacked for convenient use.

Since the job covered over two acres, it was reasoned that a single stockpile would not be convenient for all local areas, so the location of the conveyor was shifted several times during the delivery period, in order to establish several "centralized" work-centers. This re-

duced subsequent materials handling.

A second practical method is indicated by the extensive use of Dexion sections in the construction of assembly benches, work platforms and scaffolds. As shown in several pictures the sections and fittings offer unlimited opportunities for structural variation.

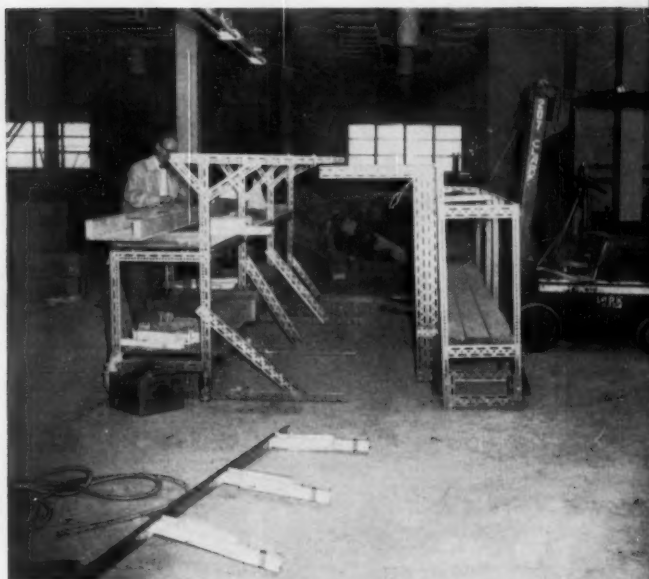
And, since they are easily connected and disassembled, parts are completely salvable and may be compacted into convenient bundles for later transfer to other job-sites.

For example, on the Northrup job, an assembly bench was made with stabilizing floor braces, a plywood working surface, and an upper rack where assembled work could be stored. In this case the assembly work consisted of long channels (serving both as wireways and basic supports for the lighting grid system) and series of right-angle legs (designed to support ballasts, lamp sockets and translucent-ceiling T-bars).

In the photo showing this assembly bench, note also the 2-man mobile scaffold at the right. Mounted on the fork of a battery-operated lift-truck and likewise formed from Dexion sections, the scaffold has several horizontal arms which



INCLINED CONVEYOR was used to transfer cartons of lighting system components from trucks to upper window sills where equipment was removed from the continuous belt and stacked conveniently for later use. Inclination of conveyor is governed by pivoted supporting frame which, when moved inwards by winch cable, raises far end of conveyor truss.



SLOTTED SECTIONS were used extensively to fabricate such items as work benches and mobile scaffolds. Note how horizontal arms of scaffold (mounted on fork of lift truck) slide beneath and between horizontal arms above work surface of bench. Work surface of plywood and catwalk of planking provide ample space for parts assembly and worker movement.

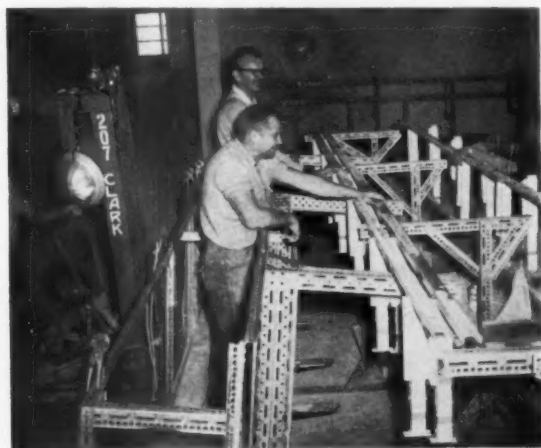
(when the scaffold is lowered to floor level) extend beneath and between the previously mentioned arms of the assembly-bench storage rack. This means that, after several lighting units have been preassembled and placed on the rack, the arms of the scaffold can slide beneath and lift them without any manual handling being re-

quired. The mobile scaffold can then be driven to the desired working point and lifted into exact position for the installation operation.

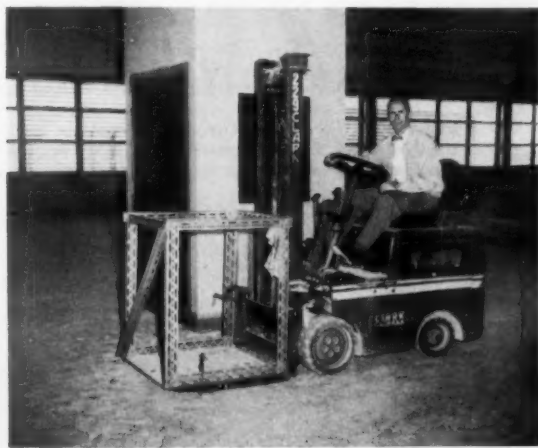
Since the scaffold is secured to the fork-lift by C-clamps and stabilizing cables, and since the weight and center of gravity of the truck is sufficient to provide a liberal mar-

gin of safety against tipping, this unit proved to be safe, time-saving, energy-saving, and gentle with assemblies being raised into position. It should also be mentioned that, since the width of the battery-operated truck is only 22 ins., it could easily pass through building and elevator doorways.

A third group of practical meth-



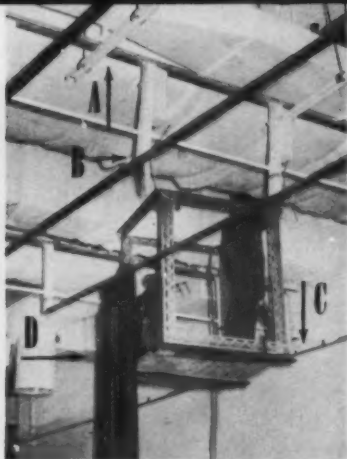
HORIZONTAL ARMS of mobile scaffold slide beneath pre-assembled grid channels resting on storage rack assembly bench. Then, when scaffold is raised slightly by fork-truck, channels are lifted without need for manual handling. Truck then moves to exact work area and raises both men and materials into desired position for installation.



WORK CAGE for single man was also fabricated from perforated metal angles, then was secured to lift truck by C-clamps as shown. Since metal sections could be readily disassembled upon completion of job, they could be bundled compactly and remained completely salvageable for re-use when again needed on subsequent installation jobsites.



POWER TOOLS were suspended over work benches by means of cables, springs and turnbuckles so that they were always within convenient reach. Slight spring tension held tools clear of work area when they were not in use and minimized weight of tools when they were lowered for such operations as drilling or nut-running during pre-assembly routines.



BENEATH DUCTS and similar obstructions, basic channel grid was supported by trapeze hanger arrangement (A). Photo also shows T-bars attached to bottoms of ballast supports and at right angles to basic grid (B); angle framing along wall to support edge of corrugated ceiling (C), and elevated work cage secured to fork of lift-truck (D).



SPECIAL ROLLER, holding 70 ft of corrugated plastic ceiling panelling, was skidded along flanges of T-bar framing as plastic was unrolled into position. Long rolling scaffold provided convenient, safe walkway for worker handling this installation detail. Note position of slimline lamps directly above T-bars and perpendicular to wireway channels.

ods concerned the use of jigs and templates to insure exact duplication of components assemblies without necessitating repeated measurements. For example, on the assembly bench can be seen a plywood form with 2-by-4 sides and metal cross-straps. In assembling the previously mentioned grid units, the long grid-supporting channels were placed horizontally on the upper rack, the auxiliary legs supporting the ballasts were positioned vertically against successive cross-straps, and components were connected accurately. Since channels and arms were pre-drilled this operation was fast mass production.

Drilling and bolting operations reflected still another practical approach, for electric drills and nut-runners were suspended over work areas by springs, cables and turnbuckles so that tools were always conveniently within reach, were easy to pull down for their intended functions, yet would automatically rise out of the way when not in use. This kept work areas uncluttered, tools clean and cutting edges of drills unfouled by metal chips or bench dirt.

After grid units had been assembled and raised into position by the mobile scaffold, they were suspended by either of two different

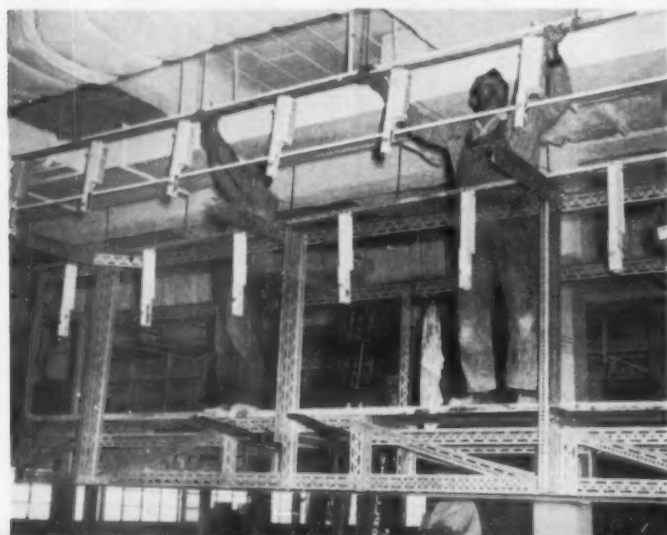
methods, depending upon local conditions. These included (1) direct rod hangers and channel clamps, with rods secured to overhead slabs by expansion anchors, or (2) double rods and trapeze channel supports to hold the grid strips when obstructions such as air-conditioning ducts were encountered.

After wireway ballast assemblies had been initially suspended in this manner, cross-braces between ballast-supporting legs were installed, and T-bars to hold edges of the corrugated plastic ceiling were added. Positioning ballasts on the outside of vertical legs had the two-fold advantage of making ballasts readily accessible for future maintenance while promoting faster dissipation of heat.

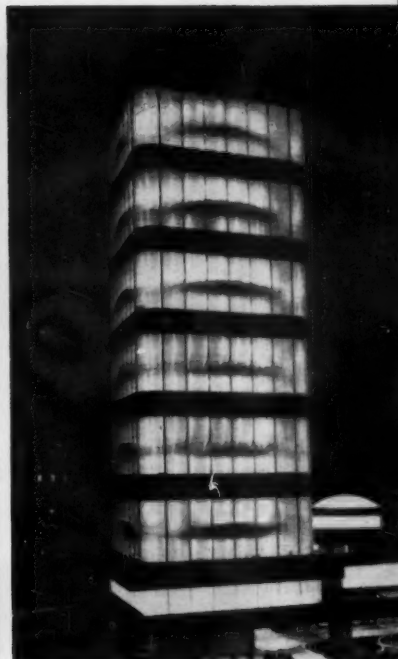
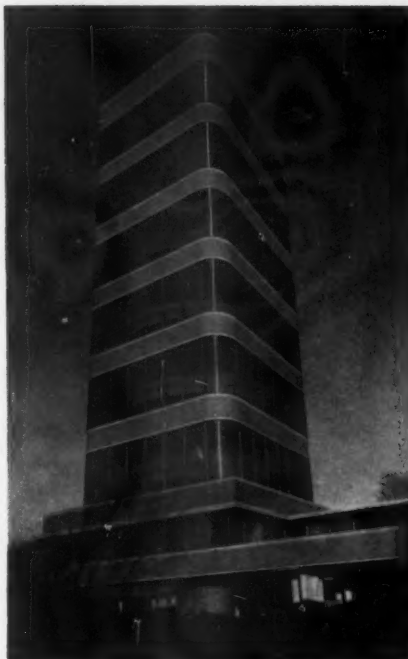
Laying corrugated plastic panels in the T-bar framework involved still another practical method, for a special roller frame was used in this process. The roller handled 70 ft of plastic at one time, with the supporting A-frame sliding along T-bar flanges as the plastic sections were unrolled into position. Long tubular-aluminum scaffolds were used in this instance so that the worker handling this detail could easily reach the ceiling level and could walk safely and freely as he slid the roller along.

Collectively, these several methods constitute another typical example where practical installation methods can pay welcome dividends in safety, time, energy—and profits.

SUSPENSION of horizontal grid channels and vertical ballast-supports was generally by means of rod hangers and channel clamps, with rods secured to overhead slabs by means of masonry expansion anchors. Cross braces were then installed between vertical legs, as shown. Note sockets (upper sections of legs) for mounting lamps at right angles to basic grid.



RESEARCH and development tower of Johnson Wax Research Center, Racine, Wis., rises 154 ft above ground, is supported on 13-ft. diameter base: Light provides individuality to architecture at night.



An Industrial Designer Looks at

Light and Architecture

A challenge to the designers, specifiers and sellers of lighting systems to consider light as a structural and psychological medium, to meet the changing trends and needs of architecture and its environment.

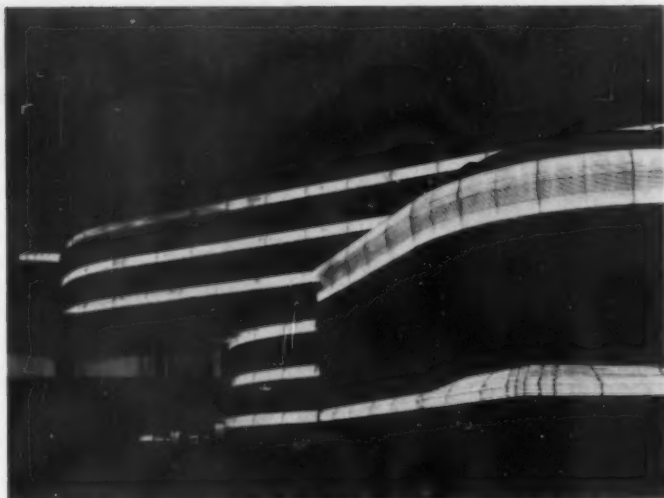
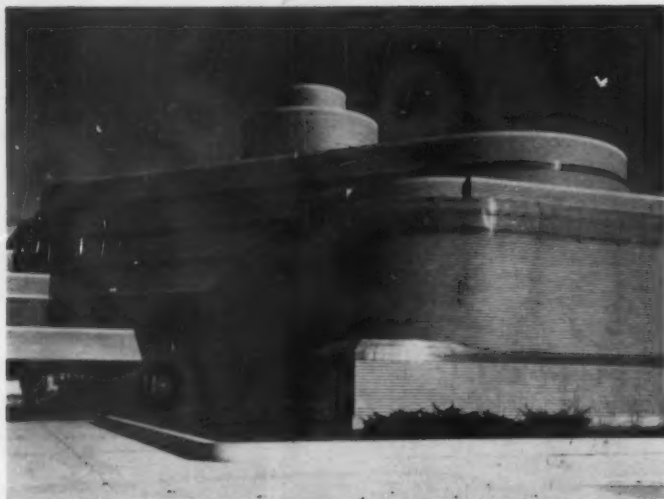
By Peter Muller-Munk

*Managing Partner
Peter Muller-Munk Associates
Pittsburgh, Pa.*

WE ARE today at the threshold of a new era in lighting. This new era is one in which lighting, in a scientific, technological and creative sense, must take its proper place in the planning of the commercial environment.

There is need to re-evaluate current methods and techniques of planning lighting systems, because these methods and techniques are no longer good enough to meet the lighting needs of tomorrow. There is, however, a very real need to look around us and try to understand what is happening in the science and art of lighting as it is now practiced, and apply this knowledge in a creative way to the lighting needs of the future.

Essentially, after a period of almost limitless increase in the quantities of almost everything, from



DOUBLE PERSONALITY of the Johnson's Wax Research Center, Racine, Wis., is provided through different dynamics of light during the day, and at night. Structures are illuminated inside and out at night by bands of light passing through miles of double walls of hollow glass tubing.

lipsticks to lumens, we are again beginning to question purely quantitative solutions as the only reasonable answers to human needs. We are at the end of an epoch in which more of anything was thought to be a virtue without reference to the ultimate effect on the human being whom this overabundance of things—and, in our case, of light and footcandles—was supposed to make free and happy.

It was a natural reaction to an age of darkness which made us long for one of light. Too much light without shadow, however, can be quite as blinding as not enough light. Light must be considered not only as a measurable quantity in

space, but as to its effect on the architectural function of this space and the psychological effect on people in such architectural enclosures. I believe, therefore, that almost every commercial lighting installation must be analyzed individually and with the most careful attention to its architectural environment, and to the specific function of the space itself whether it be a classroom, a store, a restaurant, a lobby, or entire office building. Furthermore, light, both in intensity and arrangement, should be considered in relation to climate and to the total structure of the building in daylight, as well as during night exposure. The

Johnson Wax Building, Lever Brothers, the U. S. Pavilion in Brussels, and the Seagrams Building, to mention just a few, have double personalities—different dynamics of light at noon and at midnight. Neither should be permitted to be an accident.

In place of the opaque masonry facade of the past, with its irregular pattern of fenestration, instead of dark towers with rectangular interruptions of window and frame and with purely fortuitous patterns of illumination, the luminous 24-hour visibility of our buildings of today should use lighting as a calculated structural material. We no longer consider architecture only as the art of enclosed space defined by walls and distinguishable by its silhouette against the sky, because the creative technology of today's architecture, along with the curtain wall and flexible interior partitioning, designs more and more in terms of transparencies, with light as a primary element of design, not a secondary afterthought of amateur tenants. Lighting must be planned in two ways: (1) in regard to its effect on enclosed space and (2) in regard to its influence on the total sculpture and exterior expression of commercial buildings.

Use Light as Design Element

Lighting can no longer be merely added to the fixed structures of office buildings, or shopping centers; light can no longer remain the haphazard arrangement of fixtures or even of luminous area paneling. Commercial architecture and commercial lighting have become inseparable, and it is up to manufacturers and designers to provide architects and engineers with adequate prefabricated components to enable them to design with light. More than that, we must go out and demonstrate that this can be done. We must teach the art of lighting not merely as a science compounded of footcandles and lumens, but as a functional and esthetic architectural responsibility.

This has not as yet been done. However, our objectives are really quite clear. It is the business of designers to develop standardized factory-controlled components which, in proper combinations, will give us the maximum amount of tailor-made illumination. The tech-

nology with which to achieve this is already at our disposal. Diffusing materials in almost any shape or color; the ability to throw light in almost any direction and in almost any desired intensity and quantity; even the ability to turn entire surfaces into light-producing panels: these, and many other achievements and promises, are the raw material out of which designers and illuminating engineers must develop the correct end-product.

So far, it seems, we have assumed not only that more is always better than something, but also that area lighting is superior to fixture puzzles, and that rectangular or linear patterns in our ceiling systems are the answers to everything. Well, I am not so sure.

The outstanding quality of our light-diffusing plastics and of our metallic and other supporting structures is their ability to take on almost any form, color, or texture. Baffles and all kinds of combinations of opaque and translucent materials—to say nothing of different light sources and levels—can create lighting patterns of limitless variety. To force such

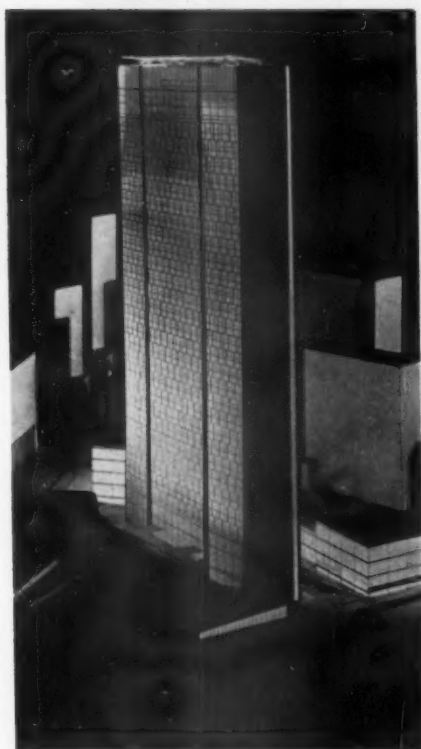
easily manipulatable elements into mile upon mile of rectangles or corrugations is to me a perversion of their inherent nature, and a misunderstanding of the function of the fluorescent lamp. It is not designing with light; it is designing with lamp bulbs, which are two quite different things.

New Architectural Trend

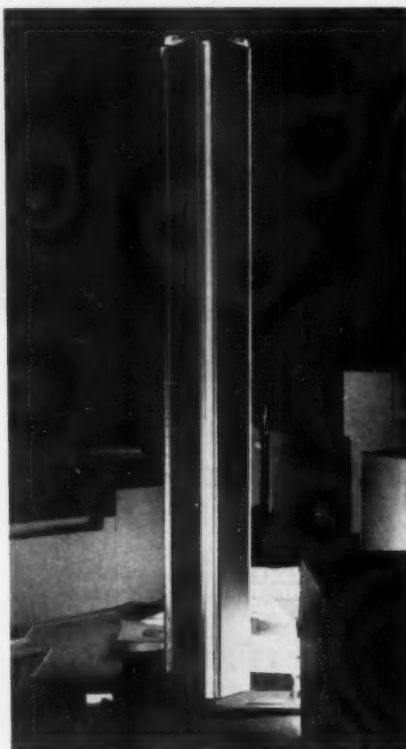
It may be said that modern commercial architecture is mostly rectangular, and that its lighting merely accentuates this trend. My answer to this is that, precisely because of so much angularity, lighting should balance this severity by contributing form, texture, and color instead of piling monotony upon monotony. Further, I believe that we might well be at the start of a new trend in architecture in which reinforced concrete, suspension principles, and new structural materials will lead to much more fluid sculptured building forms than the rectangular boxes of today. The TWA and Pan Am buildings at Idlewild, many of the new stadiums, concert halls, churches, and

factories abroad no longer work only with the principle of right angles, and even their fenestrations are no longer dependent on the conventional sash and frame. The Alcoa Building in Pittsburgh is as significant a demonstration of the curtain-wall principle as it is as a departure from conventional geometric window forms. Light, sunlight, is no longer a determining source for interior illumination. Organized light patterns have become dominating elements of the psychology of work; also the light spillage from the interior to the exterior of many of our commercial structures are now an integral part of our cityscapes and suburban centers.

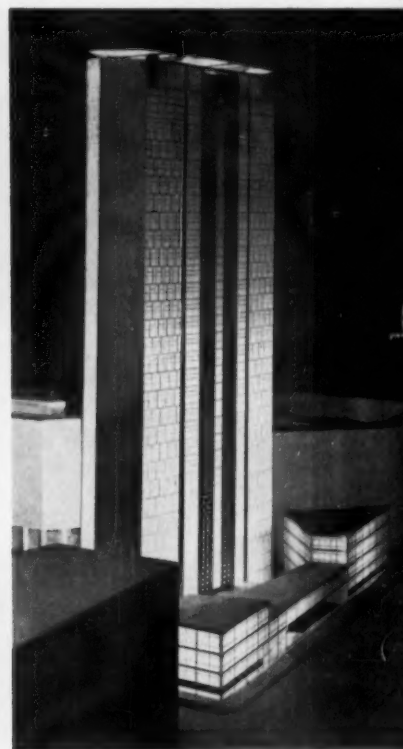
While the structural entity of our commercial beehives must, of necessity, remain static, the only inconstant and variable building material is light. Potentials for change in illumination levels, patterns, and colors are well established. Calculated adjustments of footcandles and variable-impedance dimming equipment, should permit us to adjust light to occupational concentration spans, or to decorative psycho-

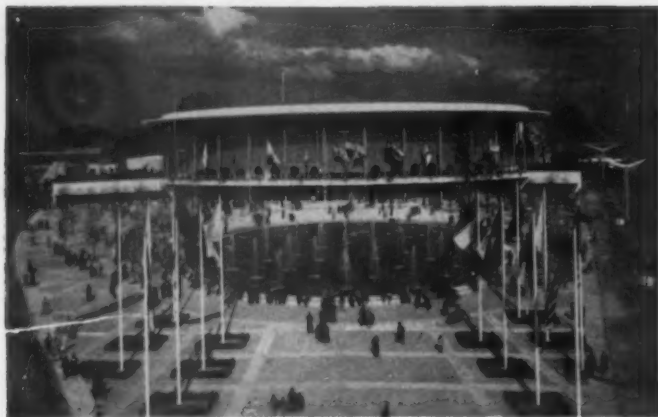


LIGHTING provides a definite esthetic as well as functional role in the new office building of Pirelli of Milan, Italy. These views are of an illuminated scale model of the proposed struc-

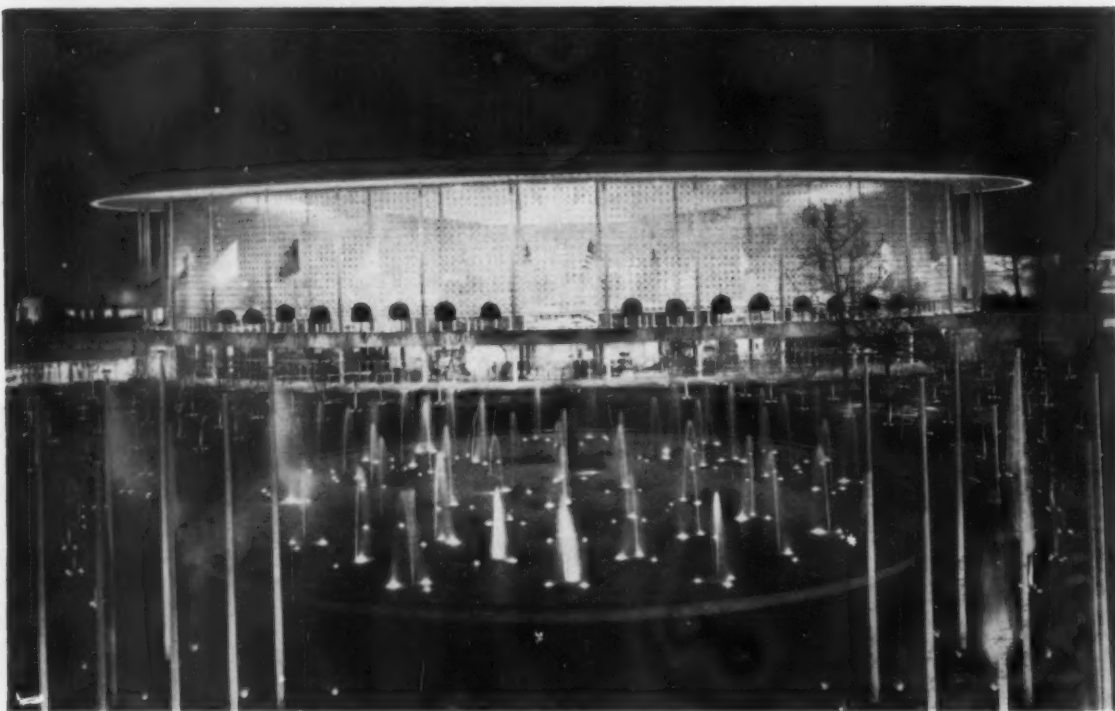


ture and illustrate the architectural consideration of lighting in regard to its influence on the exterior expression of a commercial building.





LIGHT was used as a primary element of architectural design in the U. S. Pavilion at the Brussels World's Fair, designed by architect Edward R. Stone. During the day (photo left) natural light penetrates the latticed exterior wall to illuminate the interior. Night lighting (below) provides a dramatic esthetic effect to outside viewers.



logical changes, quite literally at the flick of a switch. Is it not reasonable that candle power and light patterns for an exercise in calculus should differ from the proper atmosphere for a PTA meeting?

Too often ceilings barely provide enough illumination for the first and, perhaps, too much for the second. Change, in a functional, psychological sense, can be provided more readily with light than with almost any other medium. Still, we continue to act and sell as though light were merely a multiplication of fixtures or footcandles. Clearly this is an area for design, and de-

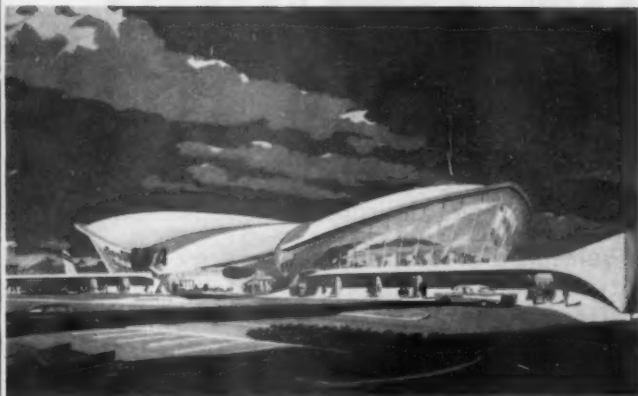
signers have not always come up with the right answers. However, at least the problem is recognized; and with the help of the lighting industry, a way will be found to solve it.

Lighting Industry Challenge

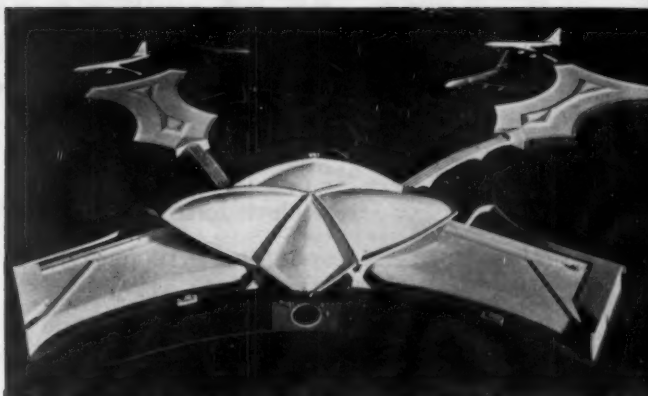
The time is now appropriate for the lighting industry to consider what it is trying to sell to the builders and city planners, not only in relation to dollar investment but also in relation to its effect on civic or rural surroundings. The road to the solution of these problems in

an industrial mass-produced, mass-marketed sense is this: we can either continue to admire or to sneer at the individual luxury experiments of men like Mies van der Rohe, Saarinen, Skidmore, and Stone. We can be forced into more and more special installations for the few affluent customers, or else, the industry must turn to specialists who are trained to translate trends into salable merchandise after having designed and engineered them to fit the rules of the controlled mass-quality product.

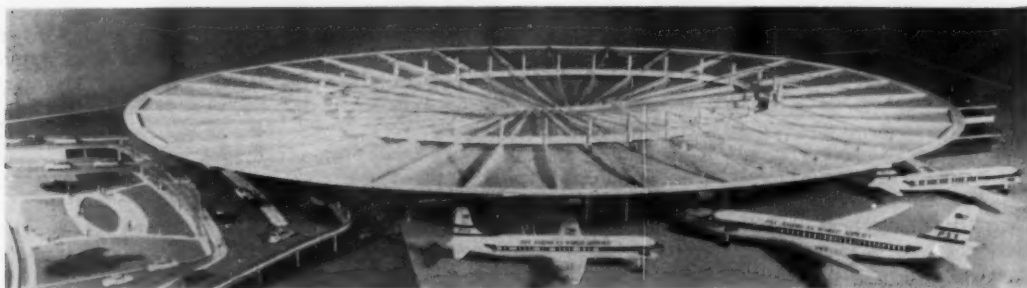
Some of the most stimulating experiments in light-diffusion media,



NEW TREND in architecture leading to more fluid sculptured building forms is shown in two new airlines terminals at New York International Airport. The Pan American terminal (below) has oval shape cantilever roof, which is concave upwards to give clearance for the tails of aircraft under its



outer edge. Roof extends 110 ft from supporting columns, covers four acres. TWA's new terminal (above) is a vast shell concrete structure. Its form suggests the flight of a mammoth bird. Four interesting vaults are separated by bands of glass skylighting, the two lateral vaults rising 54 ft at their apex.



and patterns, and of their effect on the relief of tensions, are being tried in much of our modern church architecture, both here and abroad. Diffusion and regulation of light for spiritual purposes is nothing new to our churches, of course. But just as we have borrowed from them in the past to bring lighting and brilliance into our homes, so they may again set the pace today for major innovations in our commercial interiors.

Here are some specific suggestions for improving lighting system design:

1. Wall-to-wall unrelieved area

lighting must get out of the rut of sameness and monotony.

2. Design and architecture must work together to provide standardized lighting components for custom-built installations.

3. Interior and exterior of building and lighting functions must be related to each other. Watch for the rheostatic-controlled illuminated curtain wall.

4. We should establish a cooperative industry laboratory with which we can demonstrate new systems and pilot models; and finally, we must develop new techniques which will help to demonstrate our new

lighting systems and controlled visual environments to architects, engineers, builders, school boards, lighting customers, and others. Light cannot be designed with a pencil; light can only be designed with light. This calls for a joint design-engineering and design-research project on a corporate or industry level.

Much is heard about more and better education these days. It is perhaps nowhere more needed than in the field of lighting design for the customers, and even for some of the designers, specifiers and installers of lighting systems.

Electric Home Heating Modernization

A New Jersey contractor finds electric heat desirable and reasonable under adverse heat loss requirements and relatively high energy rates.

CAN electric heat be adapted to an existing home in a 5200 degree day area where residential electric rates offer little inducement to high utilization? Edward J. Albert, electrical contractor of West Orange, N. J. believes that the tangible and intangible advantages of electric heating over fuel fired systems are important enough to offset such adverse conditions.

Albert's own home, a 35-year old residence, is an exemplary neighborhood standard of electrical modernization in which he has incorporated a full electric heating installation.

Converting his heating system from a one-pipe steam installation to a radiant baseboard arrangement was made in spite of considerable advice to the effect that it would not be satisfactory.

For example, he was reminded

that local weather records showed that annual degree days averaged over 5200; that temperatures remained at or below the freezing level from late November until early March, frequently dropping into the zero-to-10-degree region; that utility rates listed 2.2 cents per kwh as the lowest step, and that a demand charge of \$2 per month was in effect for every kw used in excess of 7½, as measured in successive half-hour intervals.

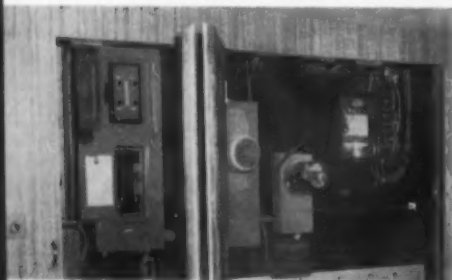
In addition, since the land on which his home stood sloped steeply from front to rear (leaving most of the basement exposed above ground), the warming component generally obtained by surrounding earth would not be available. Also, since the existing radiator system would have to be removed before radiant baseboard sections could be installed, labor related to modernization would be considerably

greater than it would be for a new home installation.

In spite of these restraining factors, Albert still believed that potential "plus" values would be obtained in the forms of zone control, elimination of temperature fluctuations, lack of noise and dirt, no coal or ashes to haul, no smoke or fumes, completely automatic regulation, and so on. Even assuming that his heating charge might double, he contended that related advantages would justify the added expense.

In designing the system for his 11,380-cu ft home, he first figured equivalent wattage requirements by rooms, considering areas, transmission factors and insulation values of storm sash and doors, rock-wool bats between attic joists, fiberglass panels on basement ceiling and loose fill blown in walls.

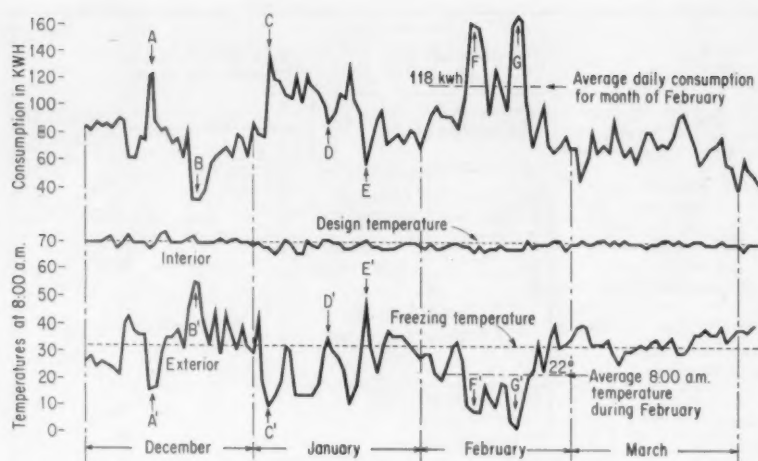
This procedure dictated the installation of 14 kw of resistance heating although, in order to include a liberal safety factor and provide sufficient units throughout the house to assure satisfaction, he increased this value 50% and installed 21 kw of capacity. While the installation of this augmented capacity was unduly liberal, it unquestionably improved the ultimate success of the system. Proof of the surplus, however, was furnished by the fact that, subsequently, units were found to be in service less than half the time—even during the coldest month of the season (February), when the average 8:00 a.m. temperature was 22 degrees and the average daily heating consumption was 118 kwh. Even on the coldest day of the season when the outside temperature at 8:00



ACTUAL KWH CONSUMPTION of heating units is verified by fact that related circuits are grouped together on basement panelboard (upper right) while system's performance is continuously charted on recording watt-hour-meter. Service entrance, rated for 200-amp capacity, has underground lead-in from utility pole line, thereby lessening possibility of ice damage to service drop.



RADIANT BASEBOARDS used to heat small New Jersey home vary in output from 750 to 2250 watts; are placed along exterior walls or opposite exterior doors to counterbalance infiltration of cold air and are individually controlled by separate dial thermostatic elements to provide zone heating feature. Units also solved kitchen problem, where exterior walls were covered by cabinets.



AVERAGE TEMPERATURE throughout living quarters was maintained within 2-degree range (plus or minus) of 70-degree design level 94% of the time during the past winter. Note "mirror image" of upper and lower graphs, indicating how ups and downs in electrical consumption (A, B, C, etc.) directly reflected outside temperature downs and ups (A', B', C', etc.). During coldest month (February) when outside 8:00 a.m. temperatures averaged 10 degrees below freezing, daily electrical consumption related to heating averaged 118-kwh; equivalent to about 12 cents an hour for that specific utility district. Even on coldest days of the year, consumptions never exceeded 170 kwh, indicating that 21-kw heating installation was in full use only one-third of the time.

a. m. registered 2 degrees above zero, the day's total consumption was only 166 kwh; a 24-hour average heating load of only 7 kw.

In estimating the probable annual kwh consumption, the owner used the formula

$$\text{Kwh} = \text{kw load} \times \text{Degree Days} \times 14$$

Design temperature difference

In this instance the kw load was taken as the *theoretical* requirement of 14 kw, rather than the *actual* installed load of 21 kw. Degree days were taken as the district's average, i.e., 5250. Design temperature difference was taken as 70 degrees minus the recommended outdoor design temperature of zero. The constant of 14, which has proven to be reasonably accurate for the New York metropolitan district and for the existing conditions, completed the formula.

Substituting these values in the above formula, the probable annual consumption for a normal year was predicted to be around 14,700 kwh. Since this past year was actually 4996 degree days, (4% below normal), the *theoretical* consumption should have approximated 14,200 kwh; whereas the *actual* electrical consumption was 13,500 kwh (about 5% below that estimate).

Even including demand charges, which averaged \$6 a month through-

out the heating season and reached a peak of \$11.80 during the month of February (for 13.4 kw less the permissible 7.5 kw, times \$2), the annual cost of heating this 6-room residence with electrical radiant baseboard sections was slightly less than \$350; less than 3 cents per cu ft for the season.

These consumption figures are not "guess-timates" but are reliable facts, inasmuch as all heating circuits for the home are grouped together on a separate basement-based panelboard, with a separate recording watt-hour meter charting a constant record of the system's performance (see accompanying graph).

As installed, the Alberts' heating system includes 15 baseboard sections of varying lengths and varying ratings (ranging from 750 to 2250 kw). They are placed along exterior walls; however interior-wall sections also have been placed opposite exterior doors (to counter-balance inrushes of cold air), in the kitchen (where exterior walls are occupied by in-built cabinets, sink, range, disposal unit, etc) and in one corner of the living room.

Individual Thermostatic Controls

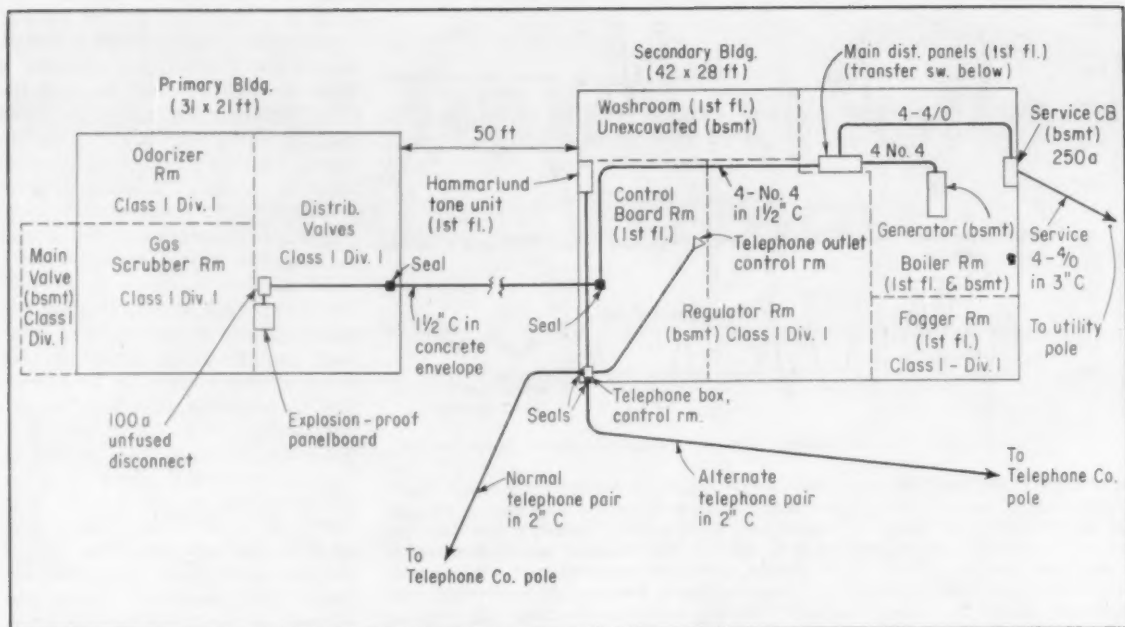
Each radiant section is operated separately by a thermostatic con-

trol that operates at line voltage (220 volts); incorporates a simple bi-metallic contact that operates a mercury switch; complies with the NEC by opening all ungrounded conductors when not producing heat; has a 1½-degree differential between On and Off levels, and operates on a frequent On-Off cycle in order to prevent excessive swings or surges in room temperature.

To prevent the house from chilling down each night, thereby demanding an excess of "make-up" heat each morning, Albert decided to set all thermostats for 70 degrees and to maintain that temperature constantly, both night and day. Sleeping quarters were cooled at night by opening bedroom windows, but doors to hallways were kept closed so that, upon waking and closing the windows, the homeowners could then open bedroom doors and promptly enjoy the warmth of the house in general.

Proof of the system's constant-temperature achievement was verified by recording thermometer readings for *all* rooms of the house *every* morning during the heating season, readings being taken each morning at the same hour: 8:00 a.m. During a 4-month period (December through March inclusive), these various thermometer readings averaged *exactly* 70 degrees more than 40% of the time, and they were within 2 degrees (plus or minus) of that desired level on *all but seven* mornings (when exterior temperatures had either risen or dropped rapidly during the night).

Since metal enclosures for heating elements are vented at top and bottom, heat is convected upwards as well as being radiated outwards. This results in gentle circulation of air and a minimum variation of temperatures between floor and ceiling. Also, since radiant baseboards are compact in design and can be either surface-mounted or semi-recessed, they are easy to install and they occupy little room. Moreover, by painting them to blend with wood trim, they become inconspicuous. They also result in the elimination of bulky radiators, thereby permitting freedom for furniture arrangements. And, with separate thermostatic controls on each section, multi-zone heat regulation permits separate rooms (or even separate areas within those rooms) to be heated to exact personal desires.



DISTRIBUTION PLAN of power and telephone lines at Van Wyck station. Entire primary building is Class I Division 1 location; secondary building is Class I Division 1 except for

control room, washroom and boiler room. Two telephone pairs, normal and alternate, travel different routes to dispatcher station.

Gate Station Control

Wiring and control details of a natural gas hazardous area installation.

By Samuel O. Schwartz,

Senior Engineer, Brooklyn Union Gas Co., Brooklyn, N.Y.

REMOTE control of equipment in the new Van Wyck Gate Station, South Ozone Park, N. Y., from the main dispatcher station of the Brooklyn Union Gas Co., Brooklyn, N. Y., was accomplished using multichannel audio-tone equipment over a single telephone line leased from the local telephone company.

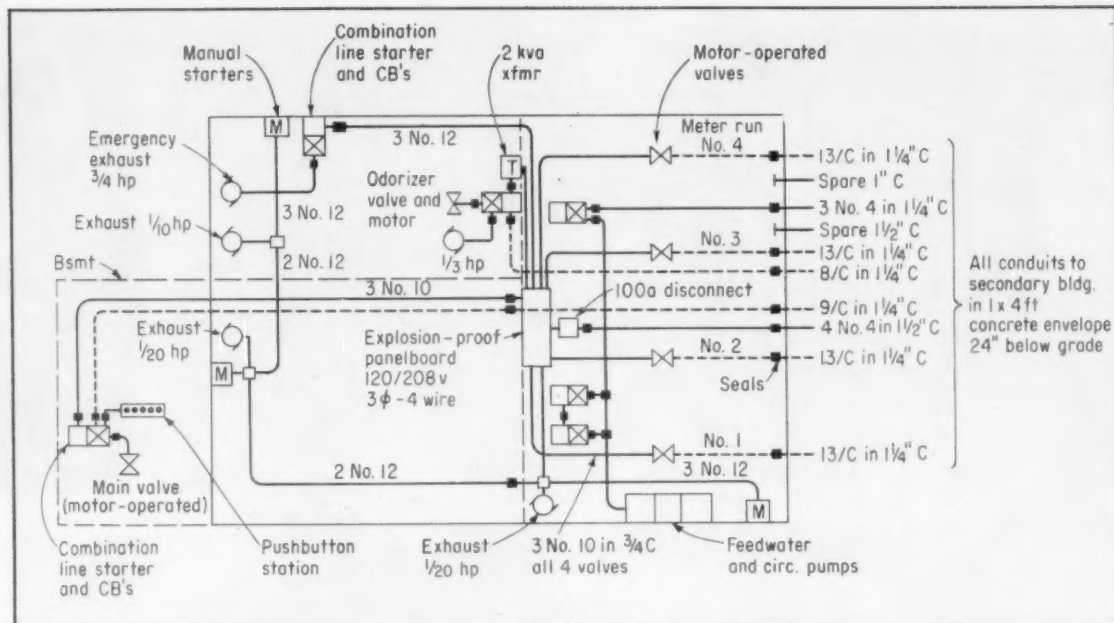
Rising operational costs made the prospects of an automatically controlled, unmanned gate station feasible and desirable. Essentially, the gate station functions to tap the main gas pipe from the natural gas fields, meter the gas, and distribute it to the consumer. In addition, the

gas must be "cleaned" and its temperature and pressure regulated. To prevent drying out of packing in pipe joints and distribution equipment, moisture must be added to the gas. And to aid in the detection of leaks, it must be odorized. Since several gate stations are either in use or planned to serve different segments of the area supplied by the gas company, there is a distinct advantage in being able to coordinate operation of the stations from a single point directly, without interposing telephoned instructions to gate station personnel.

Such a system was made possible

through the use of Hammarlund electronic transmitters and receivers at both the Van Wyck station and the main dispatcher station in the company's main offices, 10 miles away. The operator is able to read meters, observe pressures, control gas flow, odorize, and humidify—all by pressing pushbuttons and operating simple switches.

Van Wyck Gate Station is laid out in two buildings 50 ft apart on a completely landscaped plot in a residential neighborhood, hence particular attention was given to appearance and reduction of noise. Electrical service is underground; all



PRIMARY BUILDING wiring incorporates sealing fittings in all conduits leaving building as well as in those passing from one room to another. Three combination line starters shown controlling feed water and circulating pumps were installed after initial construction was completed, hence are fed directly from main panelboard in secondary building using one of three

spare conduits which were provided. Main inlet valve has open-stop-close pushbutton control (with pilot lights) at valve as well as at control board in secondary building. Control circuits are shown by dotted lines. Entire area is Class 1 Division 1, requiring explosion-proof equipment throughout. Seals are indicated by small black squares in above diagram.

feeders between the two buildings are encased in an underground concrete envelope. Outside lighting is accomplished with wall-mounted brackets having prismatic diffusing glass enclosures and 150-watt lamps. A post light near the gate entrance adds an attractive decorative touch. All outdoor lights are controlled by an astronomical time switch.

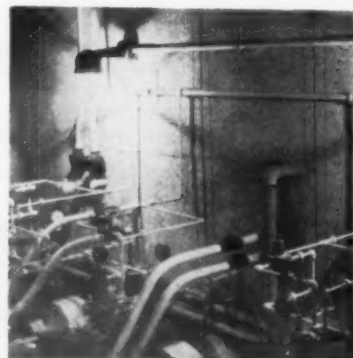
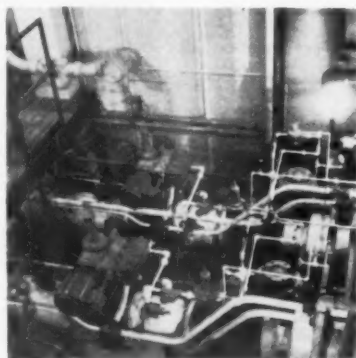
A high-frequency whistle accompanies the passage of gas through valves and metering and scrubbing equipment (which removes dust and other impurities from the gas). The noise was reduced by the application of a 2-in. layer of sound-absorbing material over an air space on walls and ceilings of the regulator and scrubber rooms.

A greater proportion of the electrical work, performed by M. Eisenberg & Bros., Inc., Brooklyn electrical contractors, was in Class 1 Division 1 (Group D) areas, requiring explosion-proof equipment. The electrical load consists of motor-operated valves, exhaust fan motors, pump motors, motors operating the fogging, humidifying and odorizing equipment, metering and control equipment, and indoor and outdoor lighting.

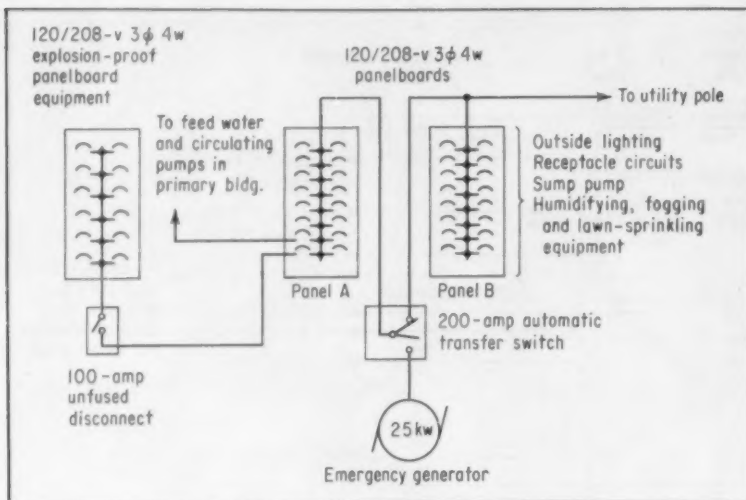
No. 12 conductors were estab-

lished as the minimum size for all branch-circuit and control wiring, regardless of the load carried. Although the National Electrical Code does not require seals in conduit between two adjacent hazardous areas, seals were provided in all raceway passing between the odor-

izer room, scrubber room and valve room of the Primary Building as an additional safeguard to localize escaping gas or explosions. All conduits between the two buildings are sealed at both ends, as are telephone raceways entering the basement of the Secondary Building.



REGULATOR VALVES for meter runs No. 3 and 4 in primary building are shown in center of left photo. Circuit from branch-circuit breaker (three No. 10) is carried in 3/4-in. conduit to explosion-proof junction box in front of and slightly below valve motor. Elbow from box to terminal housing on valve carries these conductors plus control wires. 1 1/4-in. conduit leaving box carries 13 control conductors to secondary building. Right-hand photo shows the two conduits carrying No. 3 and No. 4 valve control conductors as they pass through the building wall. Other two conduits are the main feeder to the 100-amp disconnect and the circuit to the feed water and circulating pumps. Type EYS sealing fittings are installed in each of the conduits as they leave the building. The ends of two spare conduits to secondary building are visible in this photo at far left.



SINGLE-LINE DIAGRAM shows division of load in case of utility power failure. Panels A & B are in secondary building. Panel B is sacrificed during power outage; 25-kw generator feeds panel A and primary building load through automatic transfer switch.

specifications for the job pinpointed specific manufacturers' equipment to be used in many cases.

The specs also required coded identification using color-coded wire and numbered stickers at all terminating points and junction boxes to facilitate installation and assist future maintenance.

Control

The main gas inlet valve at the Van Wyck station is normally in

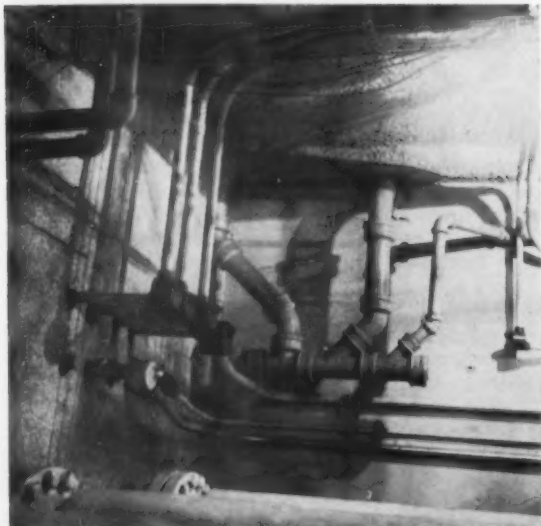
the open position and requires infrequent operation; hence it is provided only with open-close control by pushbuttons at the valve and at the Van Wyck control board.

From this valve, the gas passes through the scrubbers to four meter runs, each run incorporating a motor-operated regulating valve. The valves require frequent operation, since one or more may be closed at any one time in accordance with the demand. Accordingly, they may be opened or closed either

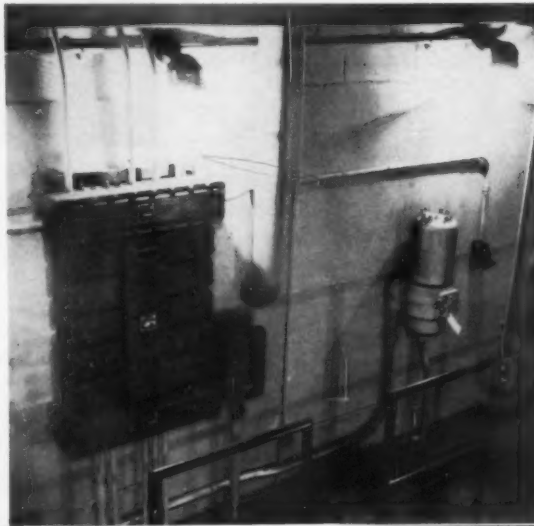
SEALING of combination starters and circuit breaker housings is shown by this view of two of the units controlling feed water and circulating pumps in primary building. Code requires each conduit run entering such an enclosure to be sealed as close to the equipment as practicable, and not farther than 18 ins. (Sec. 5015a-1 and 2). One seal suffices in the conduit between the units, since it is within 18 ins. of both. Note that junction boxes in lower horizontal 1 1/4-in. conduit are also sealed for extra protection, though not specifically required by the Code. Explosion-proof sound-powered telephone at right of starters is one of several used throughout the station for point-to-point communication during testing or trouble-shooting operations.



SEALING FITTINGS in five of the six conduits shown here in the regulator room of the secondary building are type GUAB Condulets with threaded hubs, fitted with sealing covers. Remaining conduit serves feed water and circulating pumps. One of the spare stubs was used for this circuit; a type EYS fitting was installed to avoid use of a coupling beyond the seal. Two inches of sound-deadening material line the walls and ceiling of this room as well as the scrubber room to avoid transmitting to the surrounding residential neighborhood the high-pitched whistle associated with the scrubbing operation and the passage of gas through the metering equipment.



EXPLOSION-PROOF PANELBOARD assembly in primary building is fed through 100-amp unfused disconnect at lower right. Large housing to right of panel is one of three enclosing combination starters and breakers for feed water and circulating pump motors. These pumps supply warm water for heating the gas as it enters the system from the main pipe line. Not provided for in the original specs, the pump circuit is not controlled by the 100-amp disconnect. A direct line was brought from one of the panels in the secondary building, as shown by the single-line diagram at the top of this page, using one of the spare conduits provided.





Control Board, Dispatcher Station

Panel at left controls and meters Van Wyck equipment. Pilot lamps at top are temperature and pressure alarms, gas alarm, commercial power failure alarm, and normal telephone line failure alarm. Operating conditions are visible at all times to operator seated at desk. Hammarlund tone cabinet is mounted behind partition at left of control board.



Control Board, Van Wyck

Metering and control board is mounted in non-hazardous location. Pushbutton stations and pilot lights between two rows of recorders are for control of valves. Small aluminum bars fastened to face of board constitute circuit mockup to indicate the flow of gas through the equipment. Recessed directional lighting fixtures in ceiling with asymmetric lenses and 150-watt lamps provide shadow-free lighting on face of board. Other ceiling fixtures provide general low-glare lighting of 130 fc.

from the valves, from the Van Wyck control board, or remotely from the main dispatcher station.

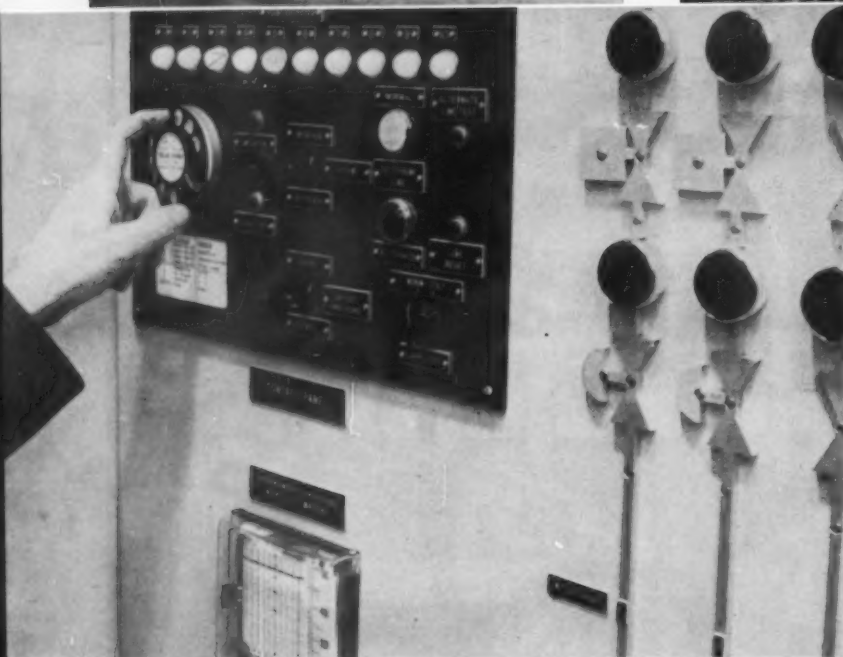
In addition, gas flow must be maintained at proper pressure; hence provision is made to control flow and pressure controllers in the secondary regulator room from the main station.

Essentially, an electronic oscillator is supplied for each function to be controlled, the oscillator generating an audible tone which may

be sent over the telephone line between the two stations by operation of the appropriate switch. This tone is received at the other end only by the particular receiver which is tuned to the same frequency, all other tones being rejected by filter circuits in each receiver. The receiver then passes on the tone to relays, which accomplish the intended control. Since signal frequencies used are pure tones, many may be transmitted

simultaneously in both directions over the same wire pair. Frequencies used are at least 100 cycles apart to insure against reception by any other than the correct receiver.

The Van Wyck station, completely unmanned except for spot checks and scheduled maintenance, is the forerunner of a number of such stations which will soon be operating throughout the Brooklyn Union Gas Co. territory.

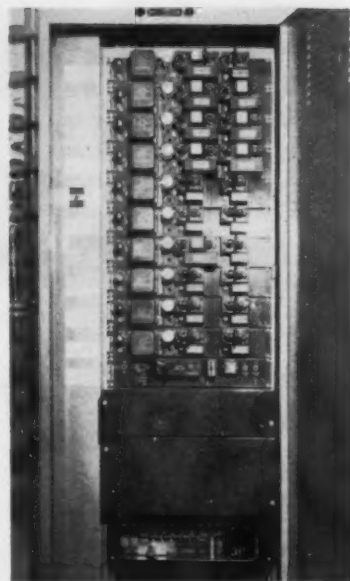


Control Panel, Dispatcher Station

Closeup photo shows dial, control buttons and switches, dial-verifying pilot lights, normal-alternate line pilot lights, test and reset buttons, and portion of circuit mock-up.

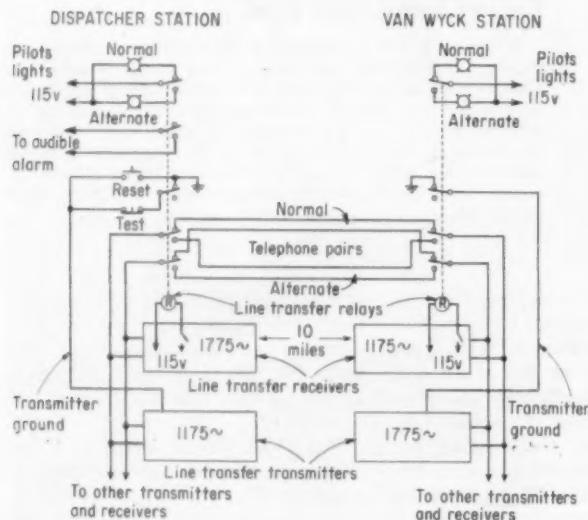
Seven of the dial's ten numbers are in use, permitting remote control of four meter runs plus fogging, humidifying and odorizer equipment. Valves in the meter runs may be opened or closed, gas pressure raised or lowered, and gas flow increased or decreased. Fogger, humidifier and odorizer may be turned on and off.

To open valve No. 2, for example, the number "2" is dialed. The verifying pilot lamp "2" above the dial would light up. The pushbutton labeled "OPEN/ON" to the right of the dial would then be pressed. As the valve begins to open, the large upper pilot light on the circuit mock-up of meter run No. 2 at the extreme right of the photo would then light up. Although not visible in the photo, the words "OPEN" and "CLOSED" are superimposed on the lenses and indicate the position of the valves. It is evident that the normal telephone pair was in use at the time the photo was made.



Tone Control Equipment, Van Wyck

Dual transmitter and receiver units for sending and receiving tone signals are stacked in cabinets at both the dispatcher and Van Wyck stations. Each dual unit is made up of three parts: a power supply (extreme left), and either two receivers, two transmitters, or one of each. Labels down the left-hand side of the cabinet identify the functions of each unit. Pulse count unit and auxiliary relays are below tone units; pilot lamps at top of rack indicate whether normal or alternate telephone line is in use.



Normal and Alternate Telephone Lines

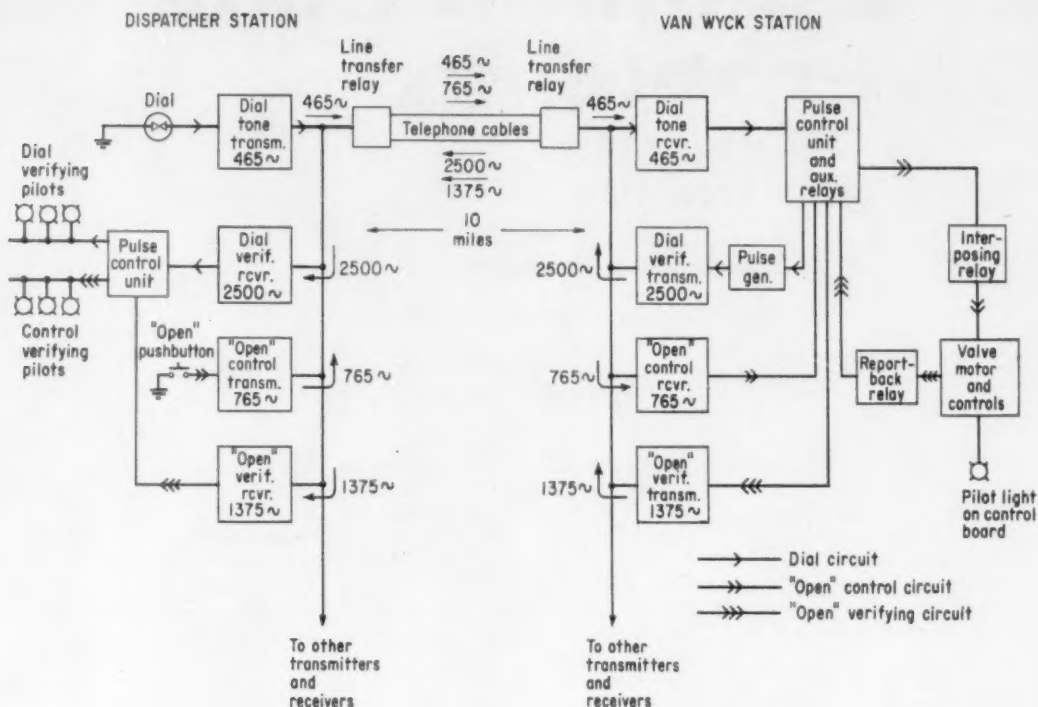
Control signals between dispatcher station and Van Wyck station are carried by single-pair telephone cable; additional pair, traveling another route, is available as an alternate.

To supervise the continuity of the normal pair, 1775- and 1175-cycle tones are continuously transmitted over the cable from Van Wyck and the dispatcher station, respectively. These tones, picked up by receivers at other ends, cause line transfer relay supply contacts to be held open. Should a fault in the cable interrupt the tones, the relays would be energized, switching all control equipment to the alternate pair, lighting alternate pilot, and sounding audible alarm.

Relay contacts also break grounding circuit of transmitters, deactivating transmitters. This prevents erratic action of transfer relays on intermittent faults and during line repair.

After trouble has been cleared, normal line is restored by pressing RESET button, which activates transmitters and re-establishes tone, deenergizing transfer relays.

During normal operation, relays and alternate line continuity may be tested by pressing TEST button, which deactivates transmitters and energizes relays.



Dialing Sequence

The first step in performing any control function remotely from the dispatching station is to dial the code number assigned to the particular equipment to be controlled. This automatically sets up a circuit at the Van Wyck station so that only equipment associated with the dialed code number will be affected by the control signals which are to follow. This is accomplished as follows:

Assume it is desired to open the regulator valve in Meter Run No. 2 (code No. 2). Dialing the number "2" interrupts twice the 465-cycle dial tone which is constantly being sent out over the telephone cable by the "dial tone" transmitter. These two interruptions operate stepping switches in the pulse control unit (PCU) at Van Wyck, setting up the relay in the PCU associated with Valve No. 2. The two pulses also trigger the pulse generator, which causes the "dial-verifying" transmitter to send two 2500-cycle pulses back over the line. These two pulses, received by the "dial-verifying" receiver back at the dispatching station, cause dial-verifying pilot lamp No. 2 to light up on the control panel immediately above the dial. The operator can then go ahead and press the OPEN pushbutton, knowing that the proper circuit has been set up to open Valve No. 2 and no other.

Control Sequence

With the proper circuit set up and verified, the operator presses the OPEN pushbutton. This completes a circuit to the "open control" transmitter, which sends a 765-cycle tone to the Van Wyck station. This tone, picked up at Van Wyck by the receiver tuned to that frequency, causes operation of the relay in the PCU which was set up by dialing. This energizes an "interposing" relay on the Van Wyck control board which closes the circuit to the valve motor.

As the valve begins to open, limit switch contacts at the valve close, turning on a red pilot light and energizing a report-back relay on the Van Wyck control board. This relay establishes a circuit back through additional contacts of the PCU relay (still set up by the stepping switch) and to an "open verifying" transmitter, which sends a 1375-cycle tone back to the dispatching station. This signal is picked up by the "open-verifying" receiver and passed on to the PCU at the dispatching station, lighting a red pilot light over the symbol representing Valve No. 2 on the control board circuit mock-up. The operator is thus informed that the control action has been completed. A visual inspection of the pilot lights at any time is sufficient to determine the positions of all controls.

Common Code Problems

Circuit Breakers

- as Branch Circuit Protection
- as Disconnect or Controller in Motor Circuits.

By B. A. McDonald

THE application and use of the conventional branch circuit circuit breaker in connection with electric motor wiring often raise questions concerning the applicable code reference and intent. The following discussion takes up some of the most common questions and their solutions.

First, we will take up the use of the circuit breaker as the branch circuit protective device on branch circuits serving motor loads.

We should preface our comment with the general observation that motor loads involve a starting current far in excess of the full load current rating of the motor. As a result, the motor branch circuit device must continue to function during the starting period of the motor, and also when subject to harmless momentary overloads. In order to satisfy such conditions of use, the usual motor branch circuit circuit breaker, similar to a fuse, is rated in line with the starting current of the motor involved. As a result, the circuit breaker protects the conductors and the motor from overcurrent due to short circuits and grounds. The branch circuit conductors and the motor are protected from gradual overloads by the motor running protective device. There are some exceptions to this general observation for fractional hp motors or when special design circuit breakers are able to satisfy all of the protection required.

Are conventional branch-circuit breakers recognized for overcurrent protection of branch circuits serving motor loads? Are special types required?

Circuit breakers are recognized as an overcurrent device suitable

for the protection of conductors as covered by Section 2403 b and c. They are also recognized for the protection of motor branch circuit conductors as covered by Section 4342 which refers to Tables 26 and 27. Columns 7-8-9-10 of Table 20, Chapter 10, further recognize such use. They are likewise listed by Underwriters' Laboratories as suitable for the protection of motor branch circuits. They can be used for this purpose since they satisfy the fundamental of protection expressed by Section 2401.

There are two types of circuit breakers recognized by the code: the adjustable trip and the non-adjustable trip (Section 2403). While either type may be used for the protection of the motor branch circuit, our comment concerns the non-adjustable type which is in common use for the protection of lighting, appliance and motor branch circuits. The breaker design provides a thermal-magnetic or magnetic trip action which assures the degree of protection provided by the code regardless of the type of load it serves. There is no special type of circuit breaker required for the protection of a branch circuit serving a motor.

Do the branch circuit breakers have to be rated in hp for motors over 2 hp? What about the 115% or 300% rating?

A circuit breaker is rated in amperes and is not required to be rated in hp. Horsepower ratings are required for motor disconnecting switches (Section 4402), since they indicate the safe interrupting capacity of the mechanism when subject to overloads. A 5-hp disconnect switch will safely interrupt

the stalled rotor current of a 5-hp motor. Circuit breakers are designed to interrupt fault currents from 5,000 to 10,000 amps depending upon the breaker rating. As a result, there is no occasion to rate a circuit breaker in hp. The rating of a circuit breaker used as protection of a motor branch circuit is covered by Table 20, Chapter 10. See Fig. No. 1.

Is it necessary to install fuses ahead of circuit breakers on motor branch circuits to provide additional short circuit protection?

An approved (UL) circuit breaker properly applied will protect the thermal overcurrent devices of a motor, the motor and also itself when subject to a short circuit. There is no occasion to use a fuse ahead of it. The code definition of a circuit breaker provides such protection and compliance with U.L. standards assures such performance.

What are the advantages of the circuit breaker in motor branch circuit protection over magnetic motor starters or manually operated thermal switches which are not permitted for this application?

Non-adjustable-trip circuit breakers are inherently dead front for safety. They are essentially tamper resistant. On polyphase circuits all poles are simultaneously opened so that single phasing of the motor is prevented. On single phase, 220-volt circuits, a double pole breaker opens all conductors to the motor when a fault occurs. Many circuit breakers are designed to compensate for ambient temperatures which assures more protection when applications involve locations which are above or below normal room temperatures. They

eliminate the necessity for replacing the overcurrent device when a fault occurs. They satisfy all code provisions with respect to the protection of motor branch circuits, while the magnetic motor starter or the manually operated thermal switch does not satisfy such provisions. Thermal devices are designed to handle gradual overloads but they are not rated to handle short circuits.

What considerations govern the use of circuit breakers as a disconnect and/or controller or as overload protection?

Branch circuit circuit breaker of the type under discussion, rated in amperes only, may be used as a controller as covered by Section 4383-d. It also may be used as a motor disconnecting means when the provisions of Section 4407 are satisfied. They are not rated in hp, for the reasons previously covered. The size is determined by reference to Table No. 20 of Chapter 10. It is significant to note that circuit breaker ratings are newly recognized in Table 20, in the 1956 edition of the code. Previous to 1956, the ratings were computed from the values given in Tables 26 and 27. There is no occasion to use fuses ahead of a circuit breaker since they are required to be designed to protect, not only themselves but the motor and the controller, when a short circuit occurs. Fig. No. 2 intends to illustrate our answer to these questions.

Ordinarily, the non-adjustable trip circuit breaker cannot be used as overcurrent protection for a motor. Such breakers must function when the motor is started and they are set to carry the initial current inrush during the period of starting. This setting may be as high as 300% of the motor full load rating. It therefore follows that such a rated breaker could not protect the motor from gradual overload since the code limits such protection to 115 or 125% of the motor current rating. In some cases, however, where the starting current of the motor is small, it may be possible for a breaker, set to handle the overcurrent protection for the motor, to function during the starting period. Section 4322-b also recognizes a manually started portable motor, 1 hp or less, connected to a 20-amp, 125-volt circuit. In this case, the 20-amp circuit breaker protecting the circuit is considered sufficient protection for the motor under the conditions out-

Fig. No. 1

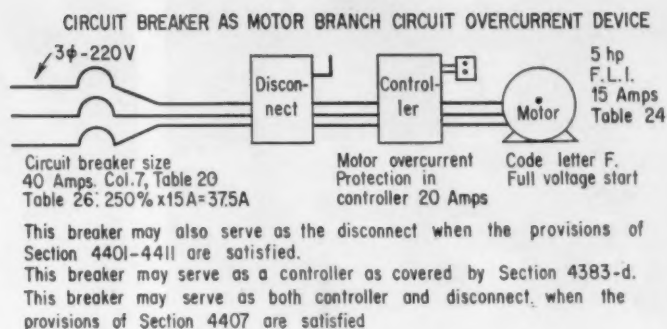
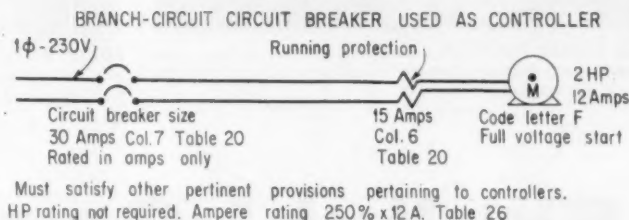


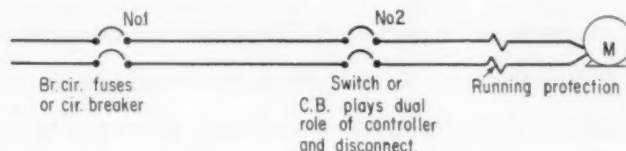
Fig. No. 2

Section 4383-d.



Section 4407

CIRCUIT-BREAKER AS BOTH CONTROLLER AND DISCONNECT



lined. A similar exception is covered by Section 4343-a which recognizes several fractional hp motors on one circuit.

Section 4383-d indicates that a branch circuit circuit breaker may be used as a controller and also as an overcurrent device. In other words, it could serve as branch circuit protection, disconnect, controller and overload protection. I personally believe it is possible to satisfy all of these functions through the use of a circuit breaker when the starting current of the motor is very small and the application is free from momentary overloads. While this personal interpretation of the code rules may be correct, it appears to me that such procedure is very questionable. The only apparent conflict appears to concern the provisions of Section 4407, which is illustrated by Fig. No. 2. If the branch circuit circuit breaker is located within sight of the motor, I see no occasion to use the second circuit breaker shown on the drawing as No. 2.

Many other questions on this

subject were answered by an excellent article titled "Coordinated Protection of Electric Motors" which appeared in the February 1954 edition of *Electrical Construction and Maintenance*. Edited by L. D. Price, Manager, Engineering and Safety Regulations Dept. of the National Electrical Manufacturers Association, it covers in considerable detail the many factors involved with the protection of motors as required by the NEC and the standards of UL.

About the same time, March 1954, L. F. Charity prepared a Progress Report to the New York Farm Electrification Council, which included observations concerning the overcurrent protection of motors involved with bulk milk cooling and silo unloaders which brings to light sub-standard motor overcurrent protection which prevails in the field.

The Abbott and Smith N. E. Code Handbook and Segall's Electrical Code Diagrams are also references which tend to clarify the questions raised.



SQUARE LENSED FIXTURES, installed in groups of four, have replaced three former skylights as the general lighting medium in the Senate Chambers.



TOTAL INSTALLATION, consisting of 27 200-watt PS lamps with ribbed glass reflectors, provides 75 fc of illumination to desktops 35 ft below.

Skylight Conversion

Modernization of Senate Chambers in Connecticut State Capitol included installation of lensed downlights in overhead bay formerly inefficiently illuminated by reflected daylight. Local switching plus remote control provides variety and convenience for this 21-kw installation by The Gunning Electric Co. of Hartford.

THE fact that many ancient governmental structures are presently being modernized electrically stresses the fact that efficient government (like modern business in general) is *demanding* the services of modern electrical equipment backed by efficient distribution features.

A case-in-point is the Connecticut State Capitol in Hartford. Built in the Civil War era, it was originally designed for lighting by gas. Then, when incandescent lamps became the order of the day, gas piping was used as raceways for a skeleton wiring system. The next progression was to a random placement of bare fluorescent lamps in some of the darker offices and corridors yet, up to only a very few years ago, the lighting system was a maintenance man's nightmare of inaccessible fixtures, dropcord push-buttons, non-uniformity of components, dust-collecting fixtures and overloaded circuits. As to the elec-

trical distribution system in general, many panelboards were inaccessibly located in normally locked rooms or up near ceilings; circuiting had been routed from any "available" switching position to distant rooms (or even to other floors); control of luminaires was therefore neither apparent, logical nor tabulated for reference; old slate panelboards in wooden cabinets still contained knifeblade switches; wiring inadequacies prevented essential load growth; and wiring insulation showed dangerous deterioration in numerous instances.

To illustrate resulting operational inefficiencies: floodlighting of the capitol's gold dome necessitated manual switching at four separate locations in attic crawl space, while relamping or cleaning fixtures in the 65-ft-high ceiling of the House Chambers meant first disconnecting flexible plug-in electrical extension cords from above,

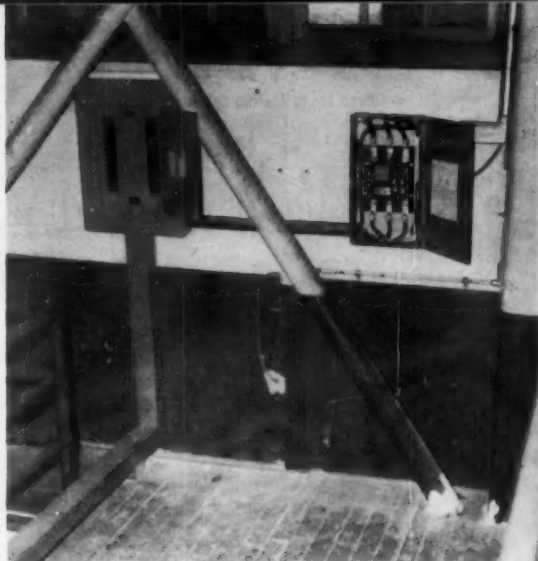
lowering units to floor-height by means of attached ropes, then raising units and reconnecting them after the necessary maintenance work had been completed. Since these chambers also had 40-ft-high cornices equipped with closely spaced "ornamental" bare-lamp fixtures, the related ladder assignment necessary for maintenance was as dangerous as it was time-consuming.

Today, thanks to an extensive, still-in-progress modernization program (see "State Capitol Rewiring" page 81 EC&M, November, 1958), the dome floodlighting is effectively accomplished by 28 500-watt roof-based projectors which are remotely, and automatically, controlled by an astronomical time clock and contactor.

And, in the recently-relighted Senate Chambers (the House relighting remains to be designed), an old skylight has been attractively converted into an efficient lighting



MAINTENANCE is from catwalks; handles on housing covers and flexible conduit connections to junction boxes facilitate easy access and free movement.



ACTIVATION of Senate Chamber lighting is via remote switch on floor below and local contactor in overhead. Panelboard permits variation of lighting patterns.

medium by installing 27 4-lens square units that provide 75 foot-candles of comfortable lighting to desktops located 35 ft beneath it.

In this installation, cleaning and relamping of the 200-watt ribbed-glass reflector units is from above, catwalks providing safe access for maintenance men. Handles on removable covers provide a simple means for opening lamp housings, and flexible conduit connections between fixtures and fixed junction boxes permit adequate freedom

of movement. This installation is activated remotely from the floor below by contactors, while local circuit breakers (in a wall panel located in the overhead space) permit a variance in lighting intensity by using lighting units in various patterns.

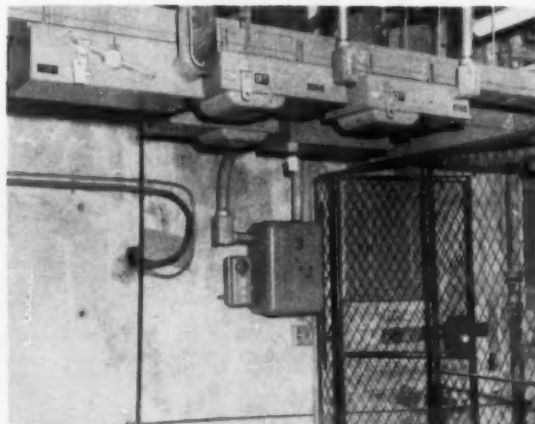
This extensive modernization program has been carried on in three sections: the first (installed three years ago by the Bower Electric Co. of Hartford) includes a new service entrance and busduct

system; the second (just completed by The Gunning Electric Co., also of Hartford) includes the relighting of the basement, chambers and offices on four floors, including new risers and panels; and the third (now in the bidding stage) includes the relighting of public areas and the possible installation of air conditioning.

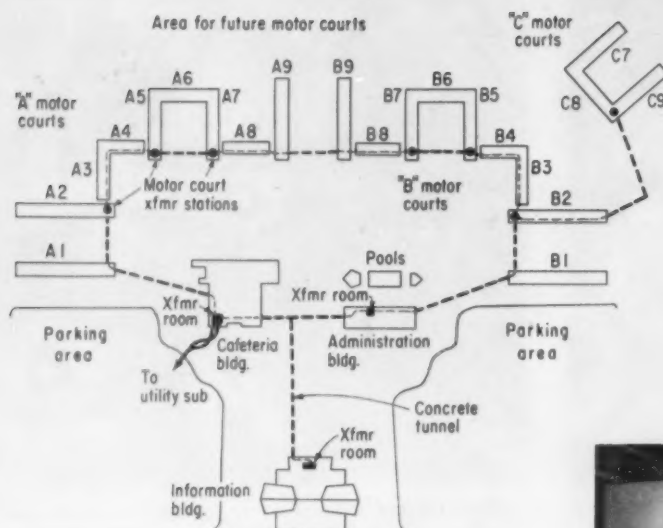
Consulting engineer for the complete modernization program was Arthur T. Flynn of Weathersfield, Conn.



AS A MARKED CONTRAST to the modern lighting now being installed in the Senate, this view shows the top-side of one of the old ceiling fixtures still in use in the soon-to-be-modernized House. Steel circular housing contains cluster of ornamental luminaires, while circular duct in left foreground conducts heat from housing to exhaust fan. Relamping or cleaning of fixture necessitates removing cover of housing, disconnecting the lighting assembly from a plug-in receptacle, attaching a rope to the unit and lowering it some 65 ft to the floor of the Chambers beneath.



TIME CLOCK with astronomical dial and magnetic switch equipped with 120-volt coils activate floodlighting of gold dome atop the historic structure. Distribution of power throughout the Capitol is now via 4-wire busducts that are carried through all main basement corridors of the building. Close spacing of plug-in breakers indicates the extent of local distribution panels.



INFORMATION CENTER layout shows location of buildings, underground tunnels carrying primary feeders, and motor house transformer stations.

PRIMARY SWITCHBOARD in basement of cafeteria building. Utility feed enters center bus transition section; three sections at right are feeder panels for 4160-volt distribution to motor courts and administration building, information building, and cafeteria building; two sections at left enclose starters for 250- and 300-ton, 4160-volt, refrigeration compressor induction motors. Each panel is separately metered.



Williamsburg Information Center Uses

Primary Distribution



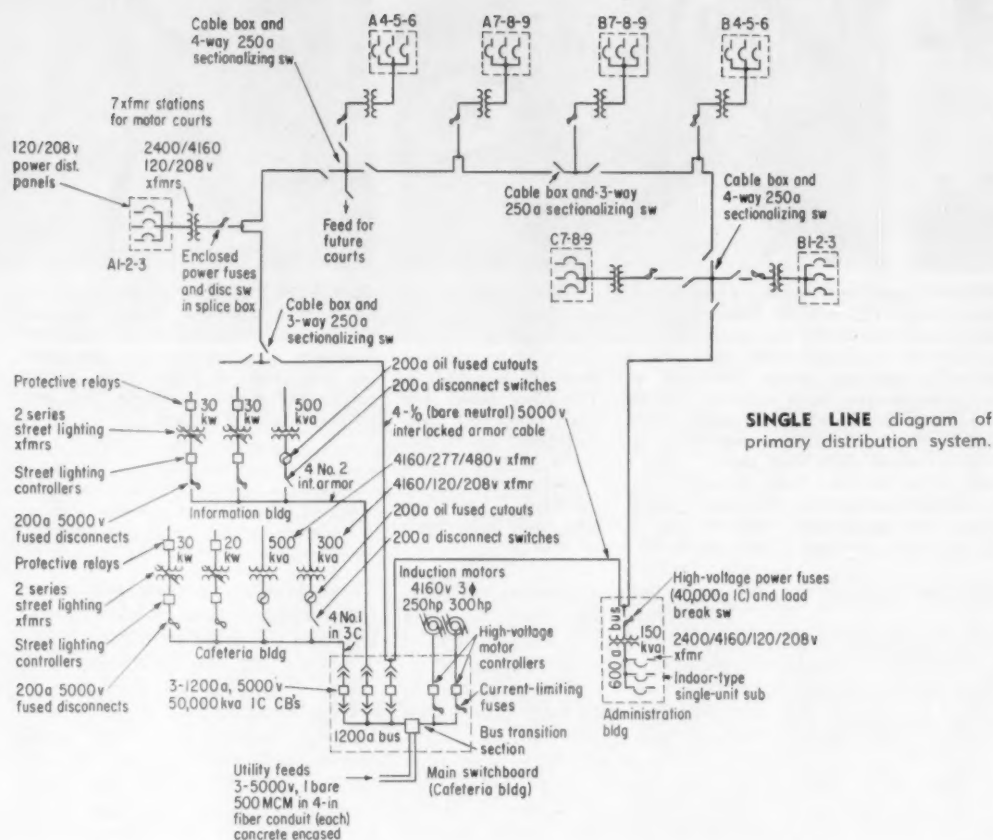
INFORMATION BUILDING secondary switchboard consists of two free-standing units mounted back-to-back to conserve space. Front section (left photo) contains three 50-hp starters to the left of the main breaker for three M-G sets used for theatre projection equipment, plus miscellaneous motor starting switches to the right. The rear unit (right photo) contains more motor switches, a lighting feeder panel, lighting feeder contactors, and astronomical time clocks controlling parking lot lighting.



ELECTRIC power plays an important part in the accommodation of more than a half million visitors each year to Colonial Williamsburg, eighteenth-century capital of Virginia.

The thousands of automobiles accompanying the growing popularity of this city made necessary the construction of a new reception and information center serving as an orientation point for the visitors. The vehicles are parked and, following an interesting and informative introduction to the many things to be seen, the visitors proceed by bus to the restored homes, shops and gardens of the city.

The new reception area is on a 40-acre wooded site adjacent to the restored section of Williams-



Primary feeders distribute 2000 kva for power, light and signals in new facility for visitors to this historic Virginia city.

At 4160 Volts

burg. Heart of the area is the information center building, incorporating twin theatres for showing orientation films and extensive exhibition and lounging areas. Other buildings include a cafeteria and gift shop, motor houses with 200 air-conditioned rooms, and a two-story administration and lounge building complete with three outdoor swimming pools.

Utility high-tension power is brought to the main switchboard in the basement of the cafeteria building by two runs of 4-in. fiber duct, each containing three 500MCM, 5000-volt conductors. Either of the two is capable of carrying the entire load. Three main distribution feeders protected by 1200-amp breakers carry 4160-volt power to

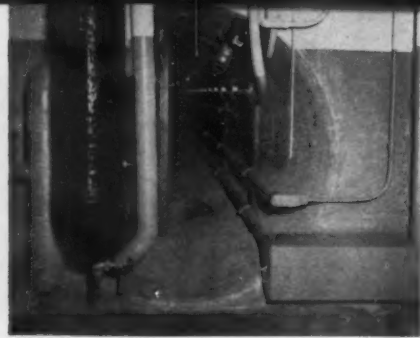
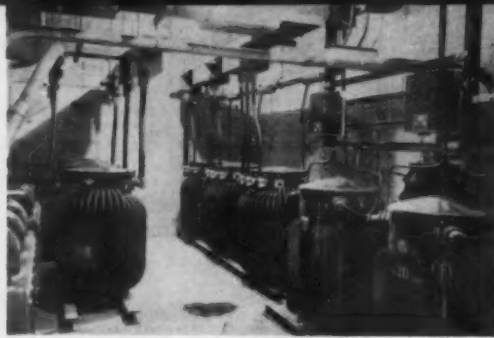
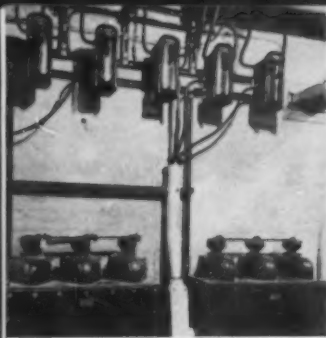
the cafeteria building load, the information building, the motor houses, and the administration building.

Motor Court Loop

The 4160-volt primary feeder serving the motor courts and administration building is 4-conductor No. 1/0 interlocked armor cable with bare neutral, channel-supported in a 5-ft diameter pipe tunnel. The cable forms a large continuous loop beginning and ending on the load side of the 1200-amp breaker on the main switchboard. Spotted on this loop are two 3-way and two 4-way sectionalizing switches, each rated at 250 amps, 5000 volts, permitting sections of

the primary feeder loop to be cut off from the supply if necessary for repair or revision. The switches also provide splicing facilities to the existing motor courts as well as means for feeding future loads as more motor courts and planned dormitories are built.

The motor courts are fed from seven points on the loop through seven 3-phase 2400/4600/120/208-volt, 75-kva dry-type transformers. Take-off to each transformer from the primary loop is accomplished in a splice box enclosing a power fuse disconnect. Fuses are high-interrupting boric acid type, with condensers and provisions for hook-stick operation. Double lugs with disconnecting links were provided to continue the loop feed where



CAFETERIA BUILDING transformer vault. 4160-volt feeder from main primary switchboard passes through two sets of 200-amp, heavy-duty, porcelain-enclosed disconnect switches (top of left photo) and down into two sets of 3-gang, 200-amp oil fused cutouts. Each set of cutouts feeds one of the two banks of transformers in the background of the right-hand photo. One bank, with three 100-kva oil-filled 4160/120/208-volt transformers, feeds cafeteria lighting. The other bank, with three 167½-kva, 4160/277/480-volt similar units, feeds kitchen equipment. Secondaries of the two banks are carried to a main secondary switchboard by the two runs of busway visible in the right-hand photo. The two units at the extreme right are 30- and 20-kw oil-filled, fully automatic street lighting transformers, rated 2400 volts single-phase primary, 6.6 amps constant secondary. These two transformers are fed from the primary feeder through 200-amp fused disconnects and street-lighting controllers mounted directly above the transformers.

CONCRETE TUNNELS carry primary cable between buildings. Tunnel entrance shown here is in information building basement. Interlocked armor cable emerges near center of photo; other conduit carries fire alarm, telephone, and miscellaneous control circuits.

sectionalizing switches were not involved.

Each of these seven transformers feeds a breaker distribution panel; three feeders from each panel supply a lighting panel for one of the motor court units. These feeder panels, like the sectionalizing switches, splice boxes, and transformers, are located in the basements of the motor courts. Each transformer station is centrally located with respect to the three motor court units it serves, so that none of the feeders to the lighting panels is more than 150 feet long. Lighting panels are located outside

the units under a covered walkway.

The remaining load on this motor-court loop is an indoor-type single-unit substation comprising the power center of the administration building, with a dry-type transformer capacity of 150 kva. High-voltage fuses are boric acid type with an interrupting capacity of 40,000 rms amps. Connection to the incoming interlocked armor feeders is accomplished with double lugs equipped with links to facilitate disconnecting one of the feeders. The low-voltage distribution panel contains four breakers with blank space for two future breakers.

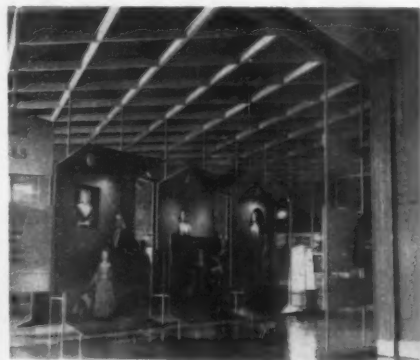
These breakers protect feeders to the administration building power load and the three swimming pools.

Except for the swimming pool water system motors, the administration building load is principally lighting, serving a drive-in registration desk and office for all motor courts, a TV lounge and game room, dressing rooms for the swimming pools, and offices for Colonial Williamsburg's Hotel Department.

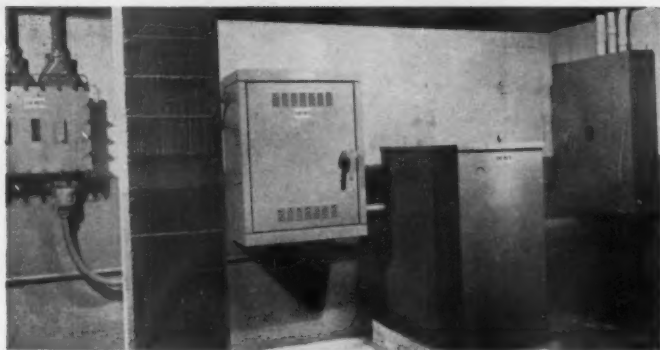
Swimming pool lighting circuits, wired throughout in brass conduit, are controlled by momentary-contact, mechanically-held contactors mounted in a split-bus panel in the



CAFETERIA CEILING lighting grid covers an area of 4612 sq ft and was assembled on the job from more than 5000 individual pieces. More than 150 450MA slim-line lamps in 4, 6 and 8-ft lengths are directed at the ceiling to furnish indirect lighting through walnut-finished wooden baffles, supplemented by 150-watt R40 downlights for brightness control in three main satin-gold anodized extruded aluminum beams and along side walls. These beams also contain lamp ballasts and wiring.



EXHIBITION AREA of information building uses incandescent spots above ceiling grid to pinpoint exhibits, the spill providing general illumination. Plug-in molding is set into top of extruded aluminum channel grid throughout its length, with outlets on 6, 12 or 18-in. centers. Spots are clamped to grid and plugged into outlets, using short lengths of asbestos cord. Covered exhibits required extra accent lights under canopy, fed through support tubing and plugged into grid outlets.



TRANSFORMER STATION, one of seven feeding motor court units. Primary interlocked armor cables enter cable splice box and sectionalizing switch from above at left; single cable continues to borac-acid power fuse disconnects in enclosure in center. Floor-mounted dry-type transformer is rated at 75 kva, 4160/120/208 volts. Power distribution panel at right contains three breakers protecting sub-feeders to three motor court unit lighting panels. Transformer was selected for quiet operation and mounted on rubber pads, being located directly beneath motel sleeping area. Note that sectionalizing switch has provision for additional 4160-volt feed at lower left of cable box for future motor courts.

switchboard room of the administration building. Underwater lights and miscellaneous fixtures around the pool are time-clock controlled during the bathing season, while step and area lights, connected to the other bus section, remain lighted all night.

Cafeteria Building

The primary feeder from the main switchboard to the cafeteria load consists of three 5000-volt and one bare No. 1 conductors in 3-in. rigid conduit, terminating in a

transformer vault in the basement. Included are two sets of transformers rated at 300 kva and 500 kva, feeding cafeteria lighting and kitchen equipment, respectively, plus two single-phase constant-current series street-lighting transformers rated at 30 and 20 kva for the parkway approach lighting and the walkway and perimeter lighting.

Information Building

This building, incorporating the exhibition areas and twin theatres, receives power from main primary

switchboard by means of 4-conductor No. 2 interlocked armor cable with bare neutral through a service tunnel identical to that carrying the motor court loop. Three 167½-kva oil-filled 4160/120/208-volt transformers in 500-kva bank protected by 200-amp oil-fused cutouts with disconnects supply building power and light requirements.

The secondary switchboard, fed by busduct from the transformer vault, consists of two front-connected free-standing units mounted back-to-back. It encloses three 50-hp starters for three M-G sets used with the theatre projection equipment, miscellaneous motor starters, a lighting feeder panel, and lighting controls. Mechanically held contactors, mounted next to feeder panel, turn on large segments of the lighting load at one time, being controlled by momentary-contact pushbutton stations at several different locations in the building. Also included are astronomical time clocks for control of parking area lighting, the settings varying both with the seasons and with the number of anticipated tourists.

The accompanying illustrations show features of the distribution system as well as lighting details. Electrical installation was by Chewning and Wilmer, Inc., of Richmond, Va.; electrical engineers were Wiley and Wilson, Richmond; lighting consultant was Gerald Ewing, Wilton, Conn.



LOUNGE AREA at one end of information center building uses same aluminum ceiling grid as exhibition area, except that dimmer-controlled cold cathode lamps are recessed into top of grid channel, reflecting off the domed ceiling. Transformers for this lighting are located in attic space above the ceiling. Unit illuminating map is extruded aluminum containing eight 200-watt PAR-46 lamps on 15-in. centers, suspended by stems from the grids and fed through one of the stems.



VISITOR ACCOMMODATION AREA of information center building uses dimmer-controlled cold-cathode lamps mounted directly on the ceiling (left) with eggcrate-type louvers installed over extruded aluminum grids. Lamp transformers are mounted in attic space (right).



Huge Market Potential for

Residential Outdoor Lighting

Home owners are spending a few billion dollars annually on outdoor living, but only a small fraction of this is spent on outdoor residential lighting systems and equipment.

By Clint Sigler

*Electrical Equipment Division
Business and Defense Services Administration
U. S. Department of Commerce
Washington, D. C.*

THE trend toward outdoor living has created a vast potential market for residential outdoor lighting systems and equipment, according to a recent study by the Electrical Equipment Division, Business and Defense Services Administration, U. S. Department of Commerce. Except in Florida and California, the market in this field is practically untouched.

More than \$3.5 billion is spent annually in the United States on other adjuncts of outdoor living, such as outdoor furniture, patios, swimming pools, tennis courts, seed, plants, tools, and the like. In 1958, more than \$250 million was spent on garden furniture alone; \$20 million on charcoal for outdoor cooking, and \$6 million for chemicals for home swimming pools. The exact amount spent on lighting the more than 3 million acres in lawns and gardens is not known, but it is estimated to have been less than the \$20 million spent for charcoal.

One factor which has created this market is that today this is a nation of home owners and not renters.

The majority of the 31 million single family units and two family dwelling units in the country are owned by the occupant.

The greater part of the outdoor lighting equipment presently installed has been for safety and protective rather than decorative purposes. Although most of it has consisted of a simple fixture using outdoor reflector floodlights to illuminate steps and paths, there has been a growing demand for post lamps. The number of such lamps using electricity is not known, but there were reportedly more than 750,000 gas-burning installations at the beginning of this year.

The principal reasons for the slow development of the home outdoor lighting equipment market, according to the BDSA study, is the lack of an initial permanent wiring service to the garden at the time of building and the high cost of installing separate circuits after a house is built. Other reasons given were the lack of a wide selection of well designed fixtures and service outlets at the medium and lower

price levels and inadequate information possessed by many home owners on the various aspects of outdoor lighting such as cost, availability of equipment, and benefits. The esthetic advantages of decorative lighting apparently have been largely overlooked, despite the fact that large sums are spent for other types of beautification.

If each of the single and double family units currently in existence purchased \$10 worth of outdoor lighting equipment this year, the market would be higher for this one phase of residential lighting than for the total industrial lighting business this year. A conservative estimate is that the sale of outdoor lighting fixtures would add at least 4 billion kw of energy annually.

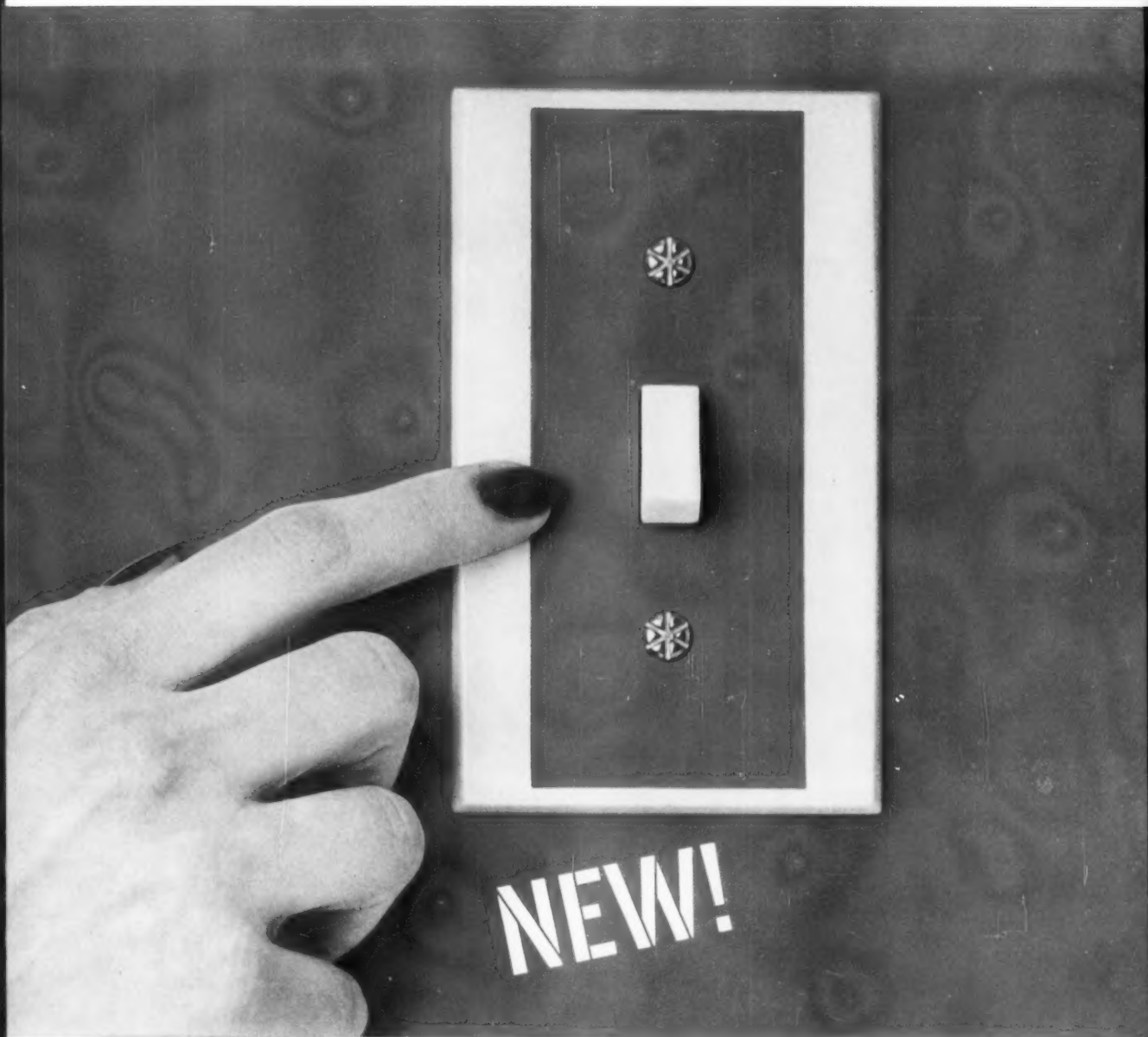
Future market development will depend largely on greater coordination among electrical building contractors, lighting equipment manufacturers, and utility companies in making available to home owners information on types of systems and services required.



OUTDOOR LIGHTING units are available in a variety of styles and shapes for lighting paths, flower beds, driveways, steps, fountains, etc., for safety and utility, for decoration and beauty, or for both.



OUTDOOR LIVING is extended and enhanced through appropriate floodlighting of patios, lawns, gardens, barbecue areas, etc., making them useful long after nightfall.

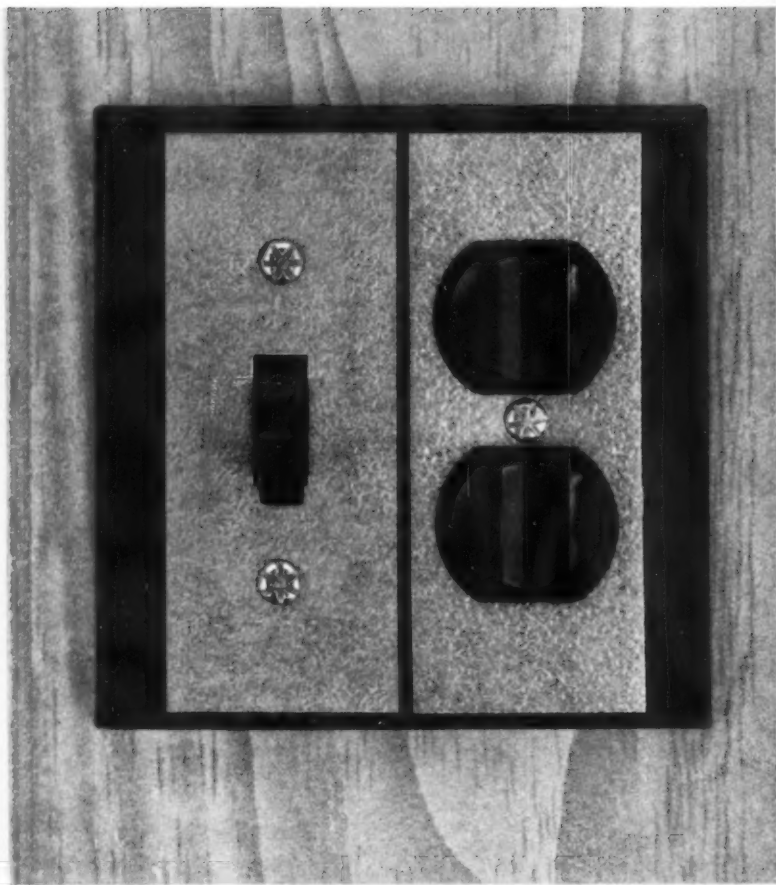
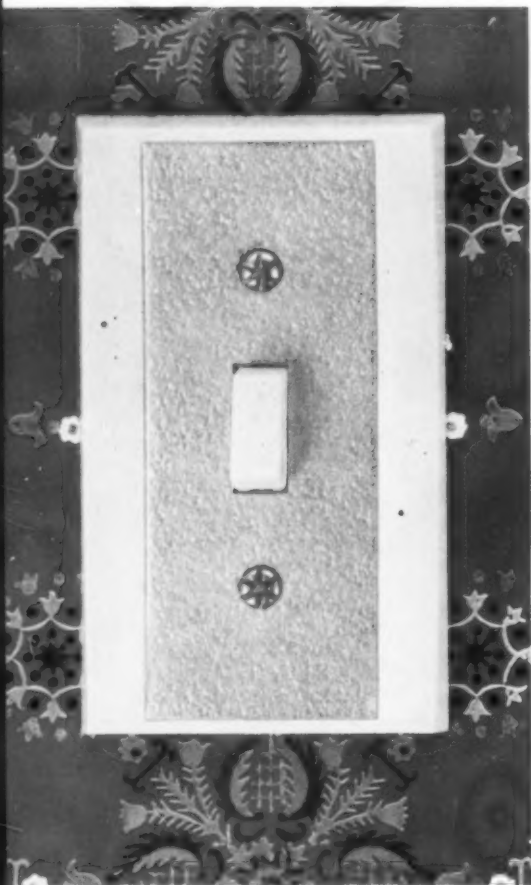


DECORATOR WALL PLATES

General Electric Wiring Device Department has created a new concept of wall plates with separate frames and inserts that offer many advantages for electrical contractors, builders, architects, and their customers.

More than 100,000 beautiful wall plate combinations can be made from just 8 basic frames and 13 different inserts in the new G-E Decorator Series of wall plates — to harmonize with any decor and meet the needs of every installation.





Use any of 13 different inserts... with brown or ivory frames - 1, 2, 3, or 4 gang - to



DECORATOR

NEW! Styled for convenience and beauty that everyone will appreciate and enjoy

This new General Electric concept of wall plates made up of separate frames and inserts is entirely different from any other wall plate on the market. With just eight basic frames — single, double, triple and four-gang (each available in brown or ivory) — you can select from an assortment of 13 inserts, in metal or clear plastic, to create "custom" wall plates that harmonize with any room's color scheme and meet the needs of any installation. The textured metal inserts are reversible — colored gold on one side, silver on the other.

FOR ARCHITECTS — G-E Decorator wall plates offer greater design freedom than ever before. More than 100,000 different wall plate combinations can be made from the few basic materials in the new G-E Decorator wall plate line.

FOR BUILDERS — G-E Decorator wall plates are an attractive extra that can be offered to customers at little or no increase in costs. (Idea: have frames installed with metal inserts, leave plastic inserts in kitchen drawer. Invite customers to "customize" their wall plates with swatches of wall paper or fabric.)

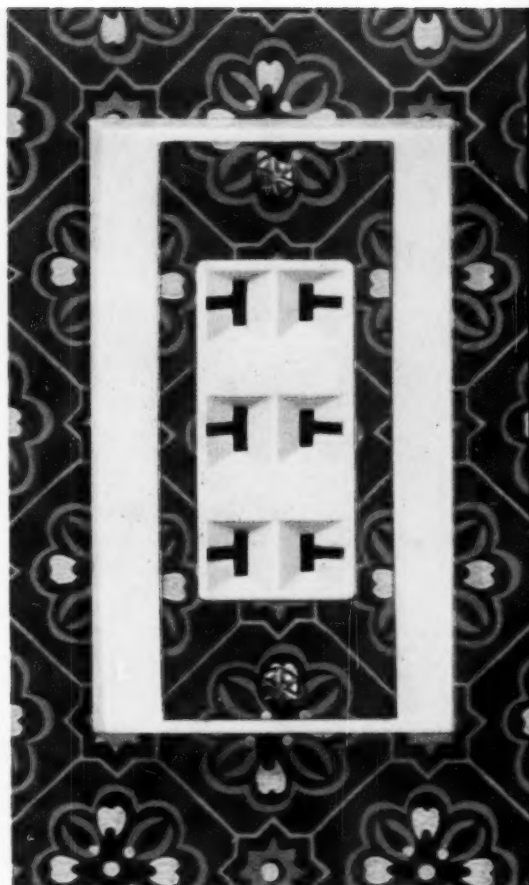
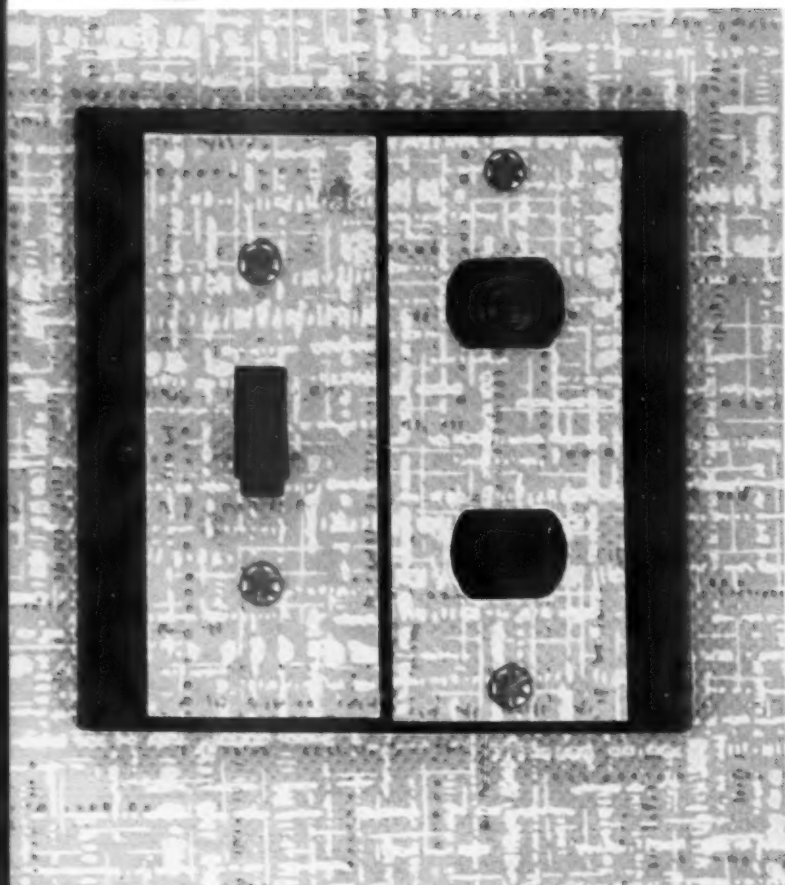
FOR CONTRACTORS — A minimum inventory — based on 8 frames and 13 inserts — enables you to install more than 100,000 different wall plate combinations. You never waste time trying to locate the right metal or plastic plate for any job's requirements. And the handsome appearance of these new plates assures customers of the high quality of your workmanship on the entire installation.

**DURABLE
SEE THROUGH
PROTECTIVE
PACKAGING**

(screws confined in special plastic bags can't scratch inserts)



GENERAL  **ELECTRIC**



meet the functional needs of any installation- or harmonize wall plates with any decor.

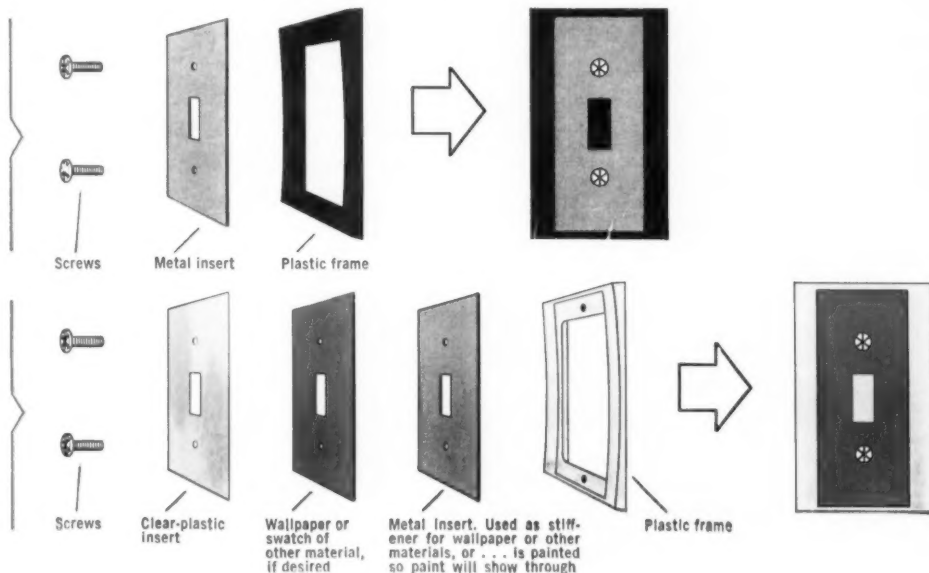
WALL PLATES

You Choose from a Variety of Color Combinations to Match any Room Interior ...brown or ivory frames and inserts in gold, silver, or clear-plastic that lets wall paper, paint, drapery-fabric or other material show through.

Choose the attractive gold-finished or silver-finished metal inserts with ivory or brown frames...

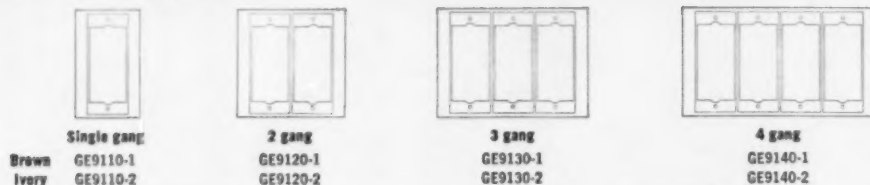
OR

The clear-plastic inserts that let the wallpaper, fabric or paint "show through".



You can match or harmonize with any color scheme ... and provide any desired switch-outlet combination with these few basic G-E DECORATOR WALL PLATE FRAMES AND INSERTS

Ivory or Brown Plastic Frames



Reversible Gold-Silver Colored Textured Metal or Clear Plastic Inserts

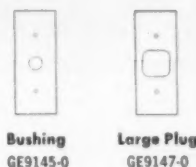


Each insert package contains one metal insert, one clear plastic insert, and screws.

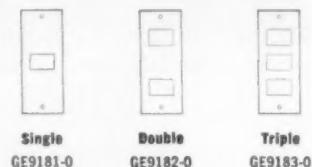
Interchangeable Line



Telephone



Remote Control



More than 100,000 beautiful wall plate combinations can be made from these 8 basic frames and 13 inserts in the new General Electric Decorator Series of wall plates.

New G-E Lighted Push-Button A. C. Switch — Turns lights ON or OFF with just the press of a finger, elbow or shoulder. Built-in neon locator light shines in the dark. Has Pressure-Lock® terminals. Listed by Underwriters' Laboratories, Inc.

*Trademark of General Electric Co.



New G-E 4-Plug Outlet — Connects up to twice as many power cords, neatly, in the same space as a regular double outlet. Accommodates four flat attachment plugs (or two round plugs, if desired). Pressure-Lock Terminals. Listed by Underwriters' Laboratories, Inc.



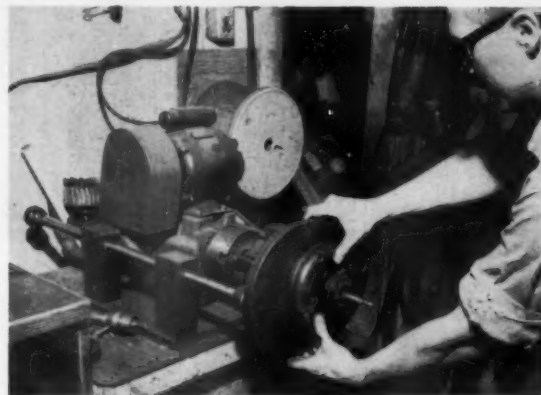
Install these Modern General Electric Switches and outlets with G-E Decorator Wall Plates
... they add safety and convenience.

Progress Is Our Most Important Product

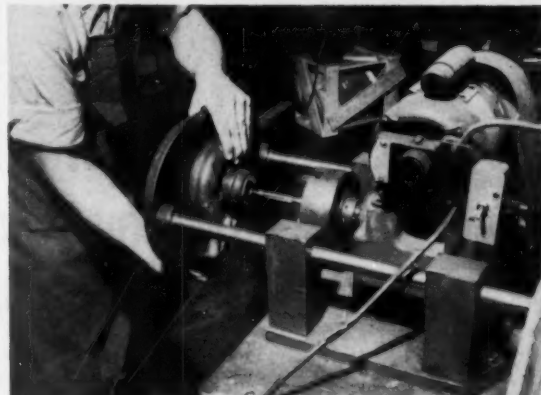
GENERAL  ELECTRIC

Wiring Device Department, Providence 7, Rhode Island

Motor Shops



LINE REAMER on bench at Wagner shop has V-belt drive to provide three spindle speeds for fast, accurate enlarging of motor bearings. Mechanic rigidly positions work against front of reciprocating face plate to assure alignment.



BACK OF PLATE can also be used as work rest because extra-long slide rods increase effective travel. Note sturdy steel block supports equipped with wiper caps to keep reciprocating rod surfaces clean. Motor reversing switch is at right.

Line Reamer Doubles As Coil Winding Unit

A unique degree of operating flexibility is a feature of a line reamer designed and built by G. I. Wagner for use in his motor repair department at Wagner Electric Company, Ft. Wayne, Ind. Through a V-belt connection between the motor (with reversing switch) and reamer drive, three spindle speeds are possible. Extra long travel of the face plate slides permits holding the work against either side of the face plate. A simple attachment quickly converts the reamer into a coil winding unit when desired.

Base of the unit is a 12-in. by 15-in. section of $\frac{3}{4}$ -in. steel plate which supports a Lempco reamer drive equipped with a 6-in. 3-jaw scroll chuck. Bolted to the top of the drive housing is a $\frac{1}{2}$ -hp, 1750-rpm, single-phase, 110-volt motor with reversing switch. Motor shaft and reamer drive shaft are V-belt connected through 3-step sheaves to provide spindle speeds of 175, 250 and 325 rpm for reaming and coil winding.

Also mounted to the base plate are four 6-in. blocks of 2-in. by 2 $\frac{1}{2}$ -in. steel which support and guide the two 1-in. dia cold rolled steel slides for the face plate. Careful positioning of the support blocks and the use of close-tolerance bearings for the slides assure accurate reamer alignment at all times. U-shaped metal covers fit over the support blocks; hold "wiping" felt or



ADDING COIL FORM to reamer drive is a simple operation. Special mandrel for chuck has slotted face plate to which form is bolted. Note 3-step V-belt drive for changing spindle speed.

similar material in place to clean the surface of the face-plate slides as they move back and forth; prevent dirt, dust and metal particles from marring slide bearing surfaces.

The two side rods rigidly support an oval, vertical face plate against which the work to be reamed is held. Made from $\frac{3}{4}$ -in. steel stock, the plate is 14 ins. long and 10 ins. wide with both surfaces machined to provide a perfectly level work face. Reamers pass through an opening in the center of the plate. By making the slide rods longer than usual, Mr. Wagner has extended the effective reciprocative travel of the face plate to approxi-

mately 11 $\frac{1}{2}$ ins. This permits the mechanic to steady the work (end bells, etc) against either side of the plate and use a variety of reamer sizes.

Should occasion demand, the reamer drive can be converted into a coil winding unit with comparative ease. To do this, the mechanic merely pushes the reamer face plate against the front blocks and inserts a mandrel in the chuck through the plate opening. The coil form is bolted to a slotted plate which threads on the front end of the mandrel. Once the spindle speed has been selected (adjusting belt of 3-step sheave drive), the unit is ready for winding coils.

Shop Benches Have Trough Test Panels

Mechanic efficiency is a prime ingredient in the successful operation of a small motor repair department. To attain this goal, many shops frequently revamp their basic layout to permit their men to do a better job in less time. Individual work areas generally provide a fertile field for improvement ideas. Often, a change in bench and tool arrangement, provision for tool and parts storage, or the addition of individual test facilities will do much to improve mechanic morale and efficiency. To bring necessary repair facilities within easy reach of the mechanic is a common goal.

Substantial progress in this di-

COUNT ON SHURE-SET

here's fastening versatility you
have never experienced before

Time- and money conscious electrical contractors everywhere are using Shure-Set on countless light-fastening jobs. Requiring no cartridge, this unique tool makes every hammer stroke more effective ... permanently sets "job-fitted" threaded studs, drive pins or wire loops into concrete, light steel or masonry faster and easier. A wide variety of fasteners makes the toughest fastening job easy with Shure-Set.

Forget drilling, filling, plugging, expansion bolts, concrete nails—Shure-Set eliminates them and gives a better fastening, too! Find Shure-Set under "Tools" in the Yellow Pages—call and find out how Shure-Set will fit into your operation.



In addition to hammer-in Shure-Set, the versatile Ramset Fastening System includes Ramset powder-actuated tools for heavy-duty fastening, and Ringblaster heavy-duty kiln gun.



Ramset Fastening System

WINCHESTER-WESTERN DIVISION • OLIN MATHIESON CHEMICAL CORPORATION
12105-D BEREA ROAD • CLEVELAND, OHIO



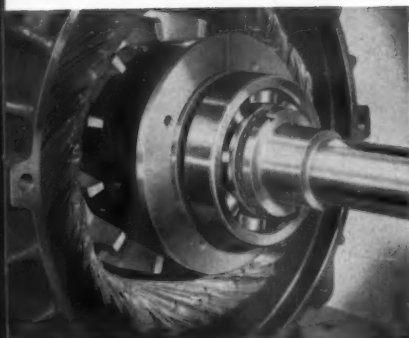
BENCH WIREWAY with row of flush receptacles pushbuttons and switches provides arms-length multi-voltage test facilities for each mechanic in Lima Armature Works' small motor repair department. Trough is conventional 4-in. by 4-in. size.



PULL-OUT SHELF and pedestal drawers for tools and parts storage are added convenience features of the individual work benches used for small motor repairs.

rection has been made in the small motor department of Lima Armature Works, Inc., Lima, Ohio. Here, the mechanics work at eight individual work benches with everything they need within easy reach. Latest improvement is the addition of a trough test panel to each bench.

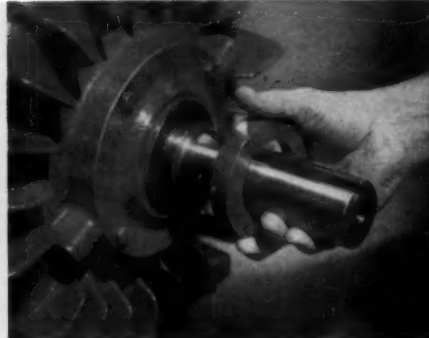
Each test "panel" is a standard 5-ft length of 4-in. by 4-in. flanged steel wireway with blank end plates. The trough is supported 10 ins. above the bench. A horizontal row of flush receptacles, pushbuttons, toggle and selector switches are mounted on the front face of the trough to provide multi-voltage test facilities. The top of the wireway supports an easy-to-read, dual-range ammeter (0-10 and 0-25 amp), test lights and main fuse box. Without moving from his bench, a mechanic can plug in and test single-phase 110- and 220-volt motors, or 3-phase 220- and 440-volt units.



HEAVY DUTY BALL BEARINGS... The ball bearings used in these motors are of the highest quality, with more than ample capacity to provide long trouble-free service under heavy loads.



BEARINGS CAN BE RELUBRICATED... Original factory lubrication will last for years in normal service—but convenient grease plugs are provided to permit relubrication that adds to motor life under severe conditions.



SECURELY SEALED FOR LOW MAINTENANCE... Both ends of these motors have running shaft seals to keep the bearings clean. Bearing housings are effectively sealed to prevent escape of grease.

Wagner Totally Enclosed Motors *Designed to give you Extra Protection*

**PROTECTED
AGAINST
CORROSIVE...
ABRASIVE
AND
EXPLOSIVE
ELEMENTS**

WM59-7

Here are motors that will deliver full-rated horsepower under the toughest service conditions—that will help you keep your production rates up, and give you the kind of dependable, continuous operation that is so important to automation.

Type EP Motors are fully protected against damage from corrosion, dust, abrasives, fumes, steel chips or filings. Type JP is explosion proof as well—is designed and approved for use in explosive atmospheres.

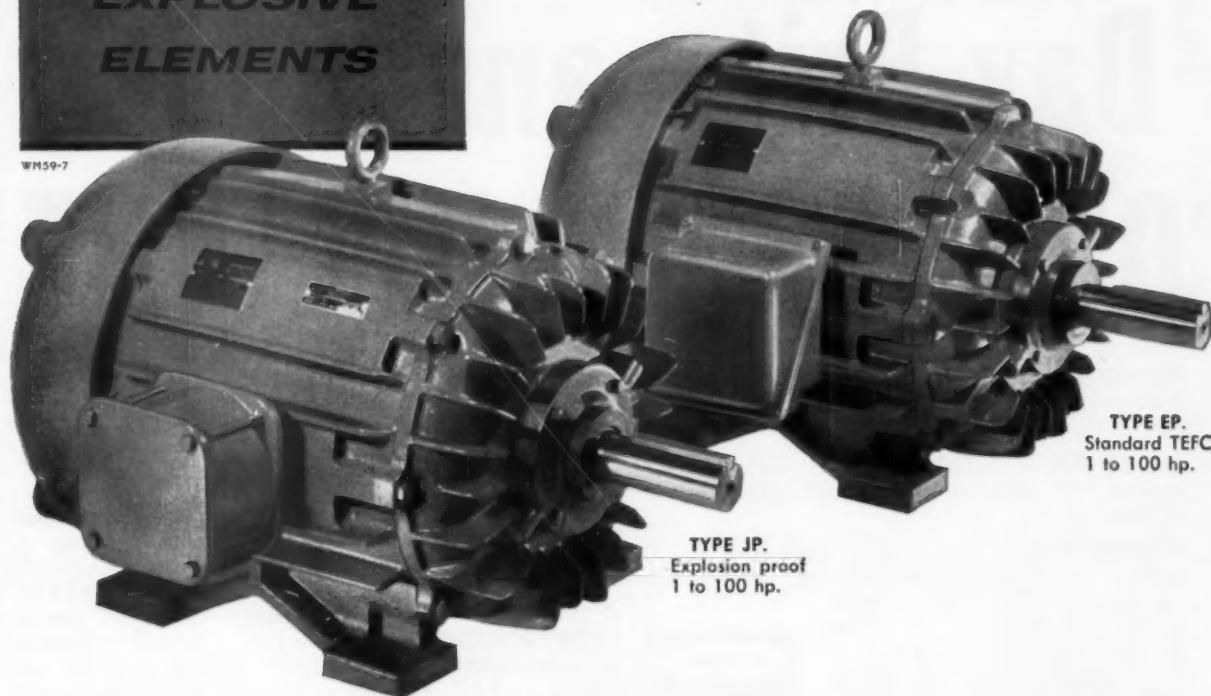
Integral ratings, 1 through 100 horsepower, are built in the latest NEMA frames, 182 through 445 US, with ribs that add mechanical strength and increase the surface cooling area.

Let your Wagner Sales Engineer show you how these protected motors can bring you savings on initial motor costs, maintenance costs, and in continuity of operation.

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TYPE EP.
Standard TEFC
1 to 100 hp.

TYPE JP.
Explosion proof
1 to 100 hp.

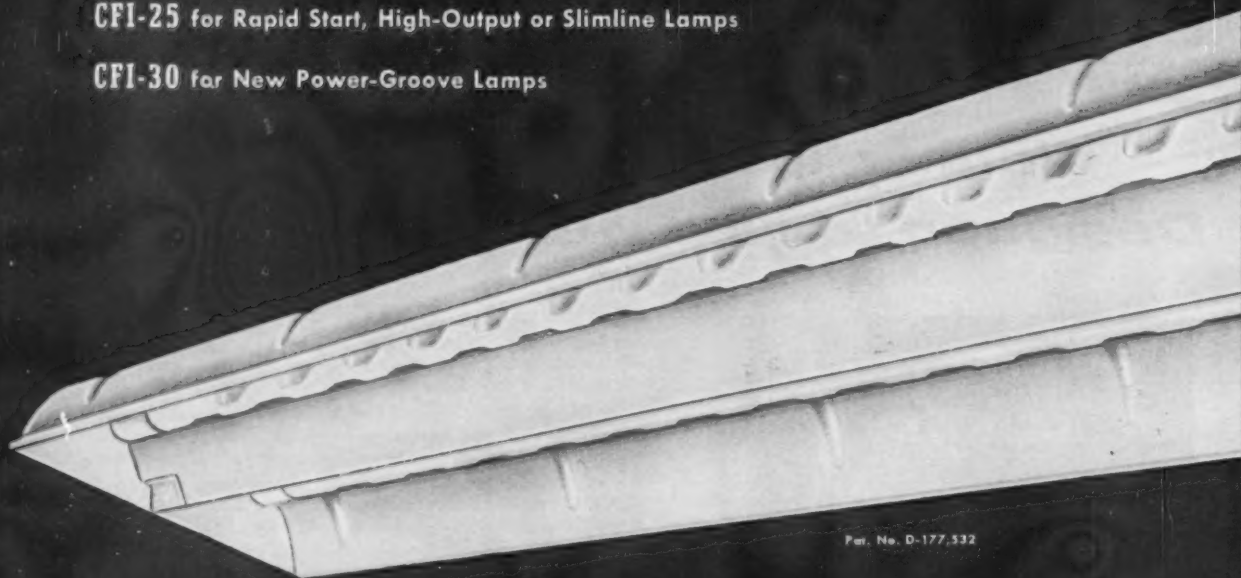
OTHER FRAME SIZES AVAILABLE IN RATINGS THROUGH 500 HP.

*Now your industrial lighting dollar buys
up to twice the light with...*

DAY-BRITE'S NEW CFI®

CFI-25 for Rapid Start, High-Output or Slimline Lamps

CFI-30 for New Power-Groove Lamps



Pat. No. D-177,532

Day-Brite announces “OPERATION UPLIGHT”

IN 1952—Day-Brite introduced Comfort For Industry with CFI lighting fixtures having slotted reflectors.

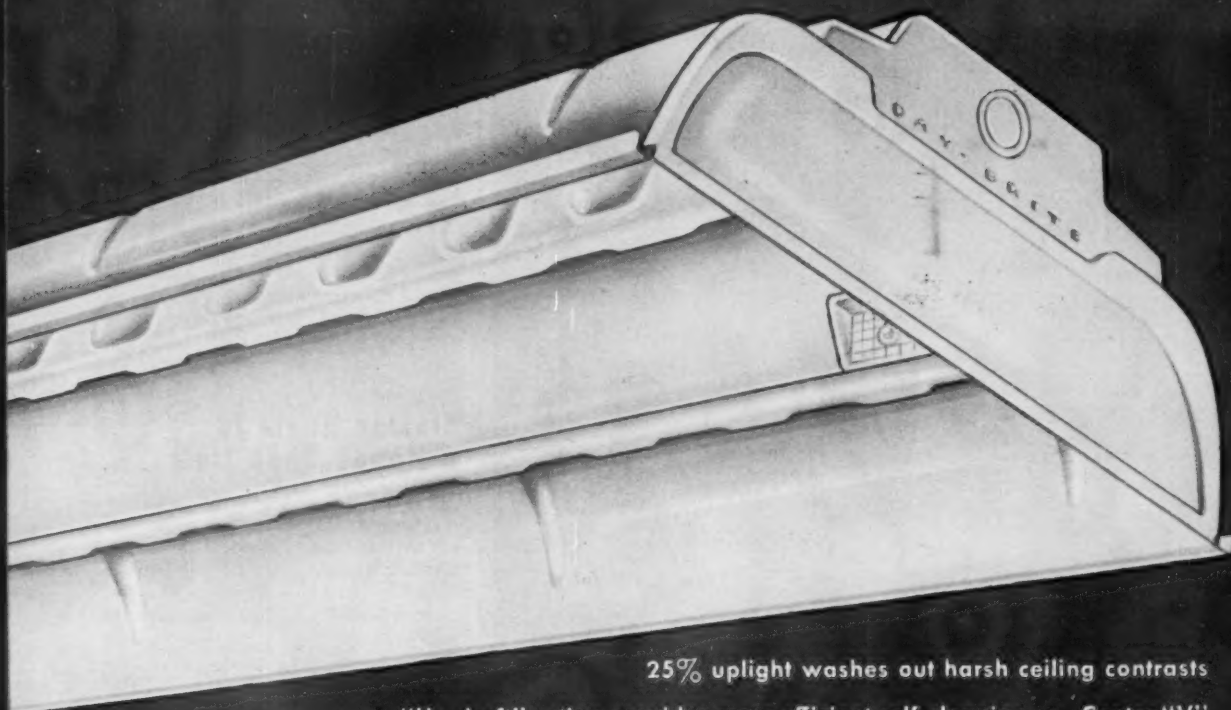
IN 1955—Day-Brite lowered installed costs for quality industrial lighting with improved CFI equipment.

TODAY—tests prove that industrial fixtures having 25% upward components and greater shielding provide *more light... with greater eye comfort... at lowest installed and total owning cost...* for all industrial lighting applications. **OPERATION UPLIGHT** is the result of these findings.

With **OPERATION UPLIGHT**, Day-Brite has now standardized its production of industrial fixtures on a basic, high uplighting design. Production savings are being passed along to buyers in **PRICE REDUCTIONS AMOUNTING UP TO 17.7%**.

Now one basic fixture, available in two adaptations for different lamps, delivers comfort lighting at lowest cost for *any* industrial application. Today's lower-priced Day-Brite CFI-30 fixture, used with new Power-Groove lamps having an output of 15,000 lumens, actually reduces the cost of lighting many industrial areas as much as 54%.





25% uplight washes out harsh ceiling contrasts

- "Up-draft" action provides more efficient self-cleaning • Center "V" and closed ends for added shielding and strength • Reflection surfaces are lifetime porcelain enamel for easy cleaning • 8-foot rigid channel, one-piece reflector for simplified installation • Spring-loaded sockets hold lamps securely, speed relamping
- ALL THIS AT UP TO 17.7% LOWER COST!

UPLIGHT for higher lighting levels at lower cost

New lighting standards adopted by the Illuminating Engineering Society approximately *double* footcandle levels previously recommended. It is estimated that between 90 and 95% of existing lighting installations are now outdated.* And now, OPERATION UPLIGHT gives owners of industrial lighting systems these new reasons for relighting—without delay:

UPLIGHT for lower installed cost.

Day-Brite CFI-30 fixtures with new Power-Groove lamps reduce installed cost per square foot by *as much as 54%* because fixture prices are lower... and fewer fixtures are needed. And installation costs are also reduced because CFI equipment is designed to go up faster... with fewer parts to handle... and line up more easily.

UPLIGHT for lower operating cost.

The Taylor-Bradley research establishes *new maintenance factors* for industrial lighting... proves that Day-Brite CFI-25

fixtures lose *44% less* light output due to dust and dirt during 30 months' operation than units having solid top reflectors.

UPLIGHT for lower annual owning cost.

Day-Brite CFI-30 fixtures with new Power-Groove lamps reduce total annual owning cost by *up to 30%* compared with other fluorescent or mercury vapor systems... and by *91%* compared with incandescent lighting.

PLUS... A BIG BONUS IN COMFORT.

Day-Brite's new CFI fixture not only delivers more light on the work plane, but also reduces eye strain and fatigue. Upward lighting *balances brightness*. Center "V" louver and fully enclosed ends (previously an extra cost feature on the CFI-25) help cut glare.

*ELECTRICAL CONSTRUCTION AND MAINTENANCE, NOV., 1958

This booklet tells how plant owners can save money through OPERATION UPLIGHT. For your copy, call your Day-Brite representative listed in the Yellow Pages. Or mail this coupon today.

A-119 © 1959 by Day-Brite Lighting, Inc.



DAY-BRITE LIGHTING, INC.
St. Louis, Mo. • Santa Clara, Calif.

NATION'S LARGEST MANUFACTURER OF
COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT



Day-Brite Lighting, Inc.
6248 N. Broadway
St. Louis 15, Missouri

GENTLEMEN: Please send me your free booklet on "Operation Uplight."

Name Title

Firm

Address

City Zone State



ONLY TWO PIECES TO INSTALL
...and both Light-Weight

WITH GARCY "ULTRA-LUX"
 Curved diffuser in 12" or 24" widths



OR 60TH ANNIVERSARY
 Rectangular diffuser in 12" or 24" widths



It's a snap to install these Garcy fixtures. Only two basic parts to install, that's all. No on-the-job assembly work. End plates, diffuser panels and hinge fittings are all pre-assembled for you before shipment.

And Garcy fixtures are easy to handle. Even a lightweight like the gal above could handle these compact fixtures all day without tiring.

Find out for yourself how much on-the-job time you can save with Garcy fixtures.

Send for Bulletins
 581-L and 582-L.



GARCY LIGHTING

division of Garden City Plating & Mfg. Co.
 2475 Elston Ave., Chicago 47, Illinois

CHICAGO • NEW YORK • LOS ANGELES • TORONTO

Work benches are 5 ft long, 26 ins. deep and 37 ins. high; have side and back extensions to keep tools and parts from rolling off; have five drawers for tools and parts storage and three shelves in the base. A pull-out plywood board under the center of the bench top has an opening for armature shafts; extends the effective work area of the bench. Lima mechanics like the convenience features of their individual work benches and management feels it has gained another step in its climb to higher shop efficiency.

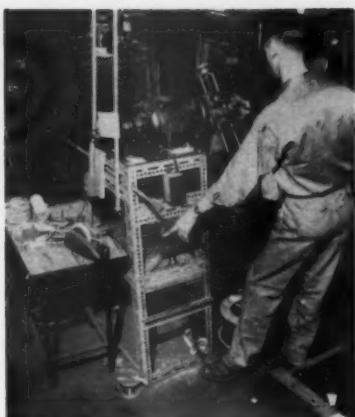
Slotted Angle Is A Handy Shop Item

Flexibility is becoming progressively more important as a feature of motor repair shop layout. Interior changes frequently are made to meet variation in repair work, market conditions, addition of sales and service items, or simply to get a little more elbow room. Adequate shelf storage facilities for equipment and parts constitute an important factor in any original or revised layout. And the easier it is to disassemble, alter or rebuild such facilities, the less costly will be the needed change.

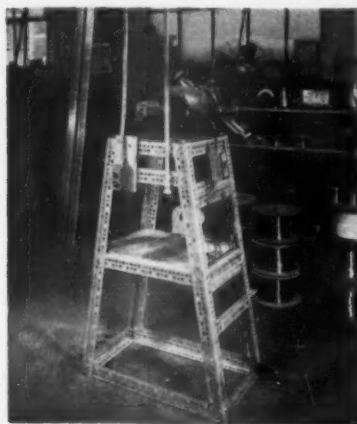
Shifts of this type are a comparatively simple matter at the J. L. Hughes Electric Company in Columbus, Ohio. They have concentrated on salvage slotted steel angle for the basic framework of their shelving. Magnet wire, controllers, instruments, spare parts and other replacement and repair units are compactly stored in this manner. Simple bolting and unbolting of angle sections cut shelf



PORTION OF SHELVING with slotted angle framework being installed in a revamped shop area. Addition of more sections or alteration of shelf height can be accomplished quickly and easily.



END BRACES support motor control switches and speed control rheostat. Conduit bar added to left is adjustable coil rack. Portable table holds coil winding accessories.



SLOTTER-ANGLE base of tapered design provides sturdy support for winding head used to make field coils and motor coils up to 25 hp size. Unit is bolted to floor.

realignment, alteration or removal time to a minimum when stock changes are necessary.

Even the repair shop mechanics have made good use of this versatile construction material. When they needed a new base for a winding head, they built one of 2½-in. by 1½-in. slotted angle. The ¾-hp, 1725-rpm, 230-volt, dc motor is bolted to a 15-in. by 16-in. steel plate 42 ins. above the floor. This plate is bolted to a slotted angle frame which tapers to a 28-in. by 16-in. base at the floor.

Bracing half-way down forms a handy shelf for coil winding accessories. Additional cross pieces support motor switches, speed control rheostat (50 to 500 rpm range), and foot-switch lever. The winding head base is securely bolted to the floor to minimize vibration and prevent creepage.

**The only fixture hanger
with 10 different choices
of receptacles . . .**

NEW...

IDEAL SIMPLET

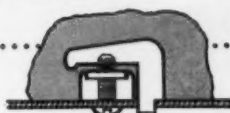
"Three-Sixty"

FIXTURE HANGER

FULL 360° ADJUSTMENT

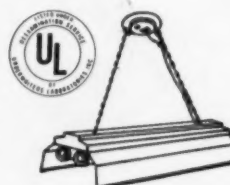
- Exclusive friction-ring suspension rotates all the way around.
- 10 different receptacle types—one for every job requirement—exclusive "Three-Sixty" feature.
- Aligns fixtures instantly, at any angle—with just a twist of the wrist.
- Simplifies engineering design, permits hanging two or four chains, or "S" hooks, from small compact arms.
- Bright Cadmium plated overall, provides neat, attractive installation.

GET FULL FACTS...SEND COUPON



SAFETY BRACKETS

Models with suffix 'X' (i.e. K-101X) have safety brackets, detailed above, which will hold on box ears should screw vibrate loose. Designed for use with 4" concrete rings, octagon boxes, SEH and GRF fittings.



For every fixture position



SIMPLET FITTINGS Division of Ideal Industries, Inc.
1041-D PARK AVENUE • SYCAMORE, ILLINOIS
Pioneers in conduit fittings and electrical specialties

CLIP TO YOUR LETTERHEAD

Send "Three-Sixty" data and prices ☐

Your Name

New MEGGER® INSULATION TESTER

... 6-Voltages
... Rectifier
Operated

FEATURES

- 6 output voltages 500, 750, 1000, 1500, 2000, 2500v d-c
- single scale, wide resistance range 0-10,000 megohm, easy to read
- rectifier-operated (plug-in to standard lighting outlet)
- excellent output voltage stabilization and regulation
- extremely rugged measuring system—instrument need not be leveled, fast indication
- single output voltage selector switch—no errors in selecting test voltage
- automatic discharge of tested insulation at end of test
- easily portable, moderate size and weight

APPLICATION

Ideal for making step-voltage resistance tests on the insulation of electrical equipment with voltage ratings in the 300, 600 and 2500v classes. Maintenance men in large industrial plants, power companies and railroad electrical repair shops find this instrument a real time saver where many tests must be made on tight schedules.

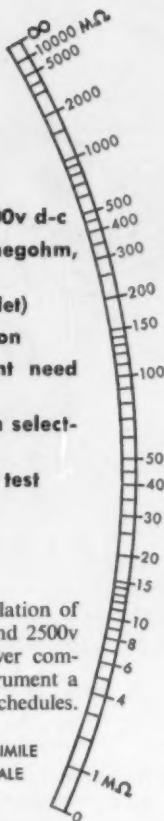


Write for BULLETIN 21-20a-ECM

JAMES G. BIDDLE CO.

Electrical Testing Instruments • Speed Measuring Instruments
Laboratory & Scientific Equipment
1316 ARCH STREET, PHILADELPHIA 7, PA.

FACSIMILE
SCALE



SMALL MOTOR REPAIRS have been the specialty of the Electric Motor Repair Co., Bridgeport, Conn., since the founding of the company in 1917, according to owner Carl A. Hermanson, caught by the camera's lens while "keeping his hand in" at typical repair work.

Adjustable Stand Supports Wide Range Of Armatures

A rugged stand, with legs constructed from 5-in.-diameter pipe and bottom cross-members formed from 5- and 4½-in. steel tubing (permitting one to fit inside of the other), supports a wide range of dc armature sizes in the Riles Armature Winding shop at Roanoke, Va. As indicated by the accompanying photographs, 5-in. channels form the outrigger base;



DISTANCE BETWEEN LEGS of armature stand may be adjusted since different diameters of cross-connecting pipes permit in-or-out movement. Desired span is then fixed by tightening of wing nuts, as shown.



ADD-A-UNIT DESIGN CUTS INSTALLATION COSTS



Individual switch units, even whole sections, can be added or changed as requirements dictate.

Here's the easy, economical way to add new circuit capacity at a moment's notice. Bulldog Unit-Versal Switchboards with their flexible design allow you to add Vacu-Break switch units, I-T-E Molded Case Breakers—even complete standard switchboard sections—quickly, safely and economically.

The compact, lightweight sections and switch units are especially designed to conserve valuable plant space. Each distribution section is a front accessible, self-contained board that can be operated alone or in combination with other sections. Individual units or sections can be added or relocated quickly

with just a wrench or screwdriver.

Vacu-Break® switch units provide maximum safety, too. Arcs are smothered quickly inside compact Vacu-Break chambers. Pitting and burning of contacts are reduced to an absolute minimum — maintenance is virtually eliminated.

The Clampmatic® spring assembly inside the Vacu-Break chambers assures clamped-pressure contacts, speeds "break", increases switch life. For safety's sake, lower cost and speedier installation buy Bulldog Vacu-Break Unit-Versal Switchboards.



BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

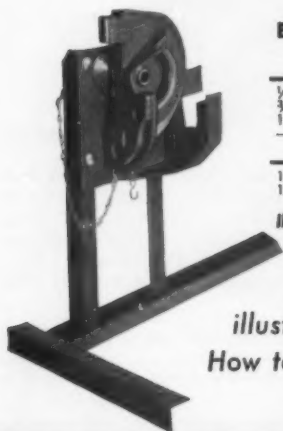
In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

LIDSEEN "Chicago" Benders are your Best Buy...



Ask the Electrician who uses one...

He's our best advertisement and your best source for a first hand opinion as to its real value on the job. They are complete machines of all steel construction . . . no loose parts to be misplaced or lost and the only maintenance is an occasional drop of oil. **Lidseen "Chicago" Benders work equally well on Aluminum or Steel Conduit.** You get accurate bends every time and you will marvel at the way it quickly produces precise repeat bends and offsets so important in exposed installations. Remember . . . ask the electrician who is using a "Chicago" Bender; he will tell you its the finest tool available and at a price that is eminently reasonable.



BENDING CIRCLES: INSIDE RADIUS

	No. 1	No. 1T
1/2" conduit or pipe	2"	EMT 3"
3/4" conduit or pipe	4 1/4"	EMT 4 1/2"
1" conduit or pipe	5 3/4"	EMT 6 1/2"
	No. 2	No. 2T
1 1/4" conduit or pipe	7 1/4"	EMT 9 1/2"
1 1/2" conduit or pipe	8 3/4"	EMT 10 1/2"

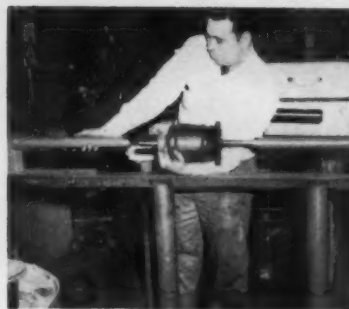
Illustrated: No. 1 for bending 1/2", 3/4" and 1" rigid conduit

Write for **FREE**
illustrated Folder on
How to Bend Conduit



LIDSEEN
OF NORTH CAROLINA, INC.

1050 FIRST STREET, HAYESVILLE, NORTH CAROLINA
PHONE HAYESVILLE 2000



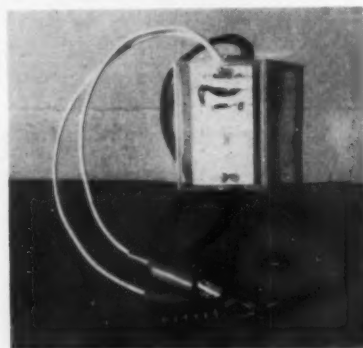
ANGLE AND PIPE ADAPTER can be bolted to tops of V-notched uprights to support armatures of smaller sizes.

wing nuts keep the tubular cross-members securely at the desired span distance, and an angle-and-pipe adapter can be bolted to the top of the V-slotted tops of the uprights to support smaller armatures on the same stand.

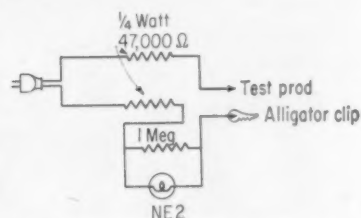
Simple Continuity Tester Easy to Make

Especially handy for outside service calls is this compact continuity tester, which trouble shooting servicemen of the Electric Motor Service Shop in Sarasota, Fla., have made for their own use.

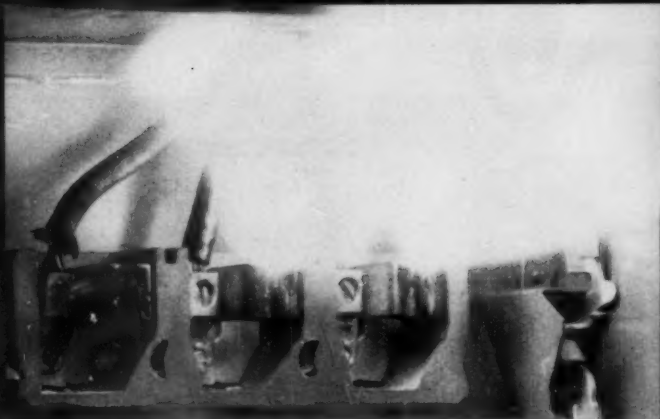
Packing easily into a pocket or toolbox, the unit is housed in a plastic cigarette case, and uses an NE2 neon glowlamp as the indicator.



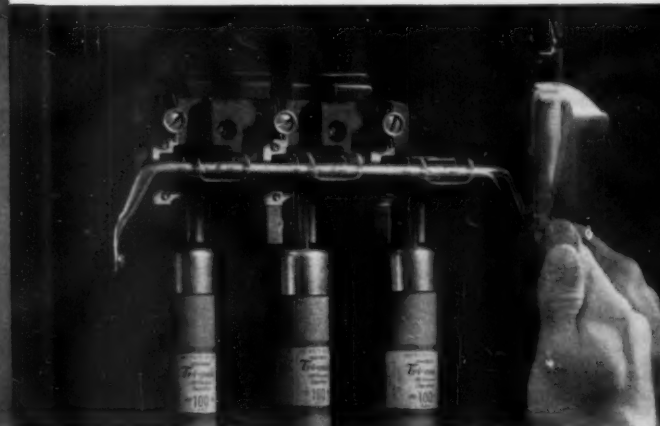
CONTINUITY TESTER is compact, simple to make, uses readily available parts and components.



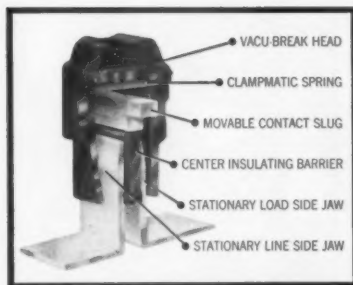
WIRING HOOKUP for continuity tester.



Dangerous flash explosion occurs at instant of "break" in open knifeblade switch. Bulldog Vacu-Break chamber smothers arcs before they can burn and pit contacts. Both are 100-amp, 600-volt switches operating under 90-ampere, 440-volt load with 40% to 50% power factor. (These photographs were taken at instant of "break" and are unretouched.)



FOR SAFETY'S SAKE BUY VACU-BREAK POWER PANELS



Close-up of Vacu-Break head shows movable contact slug inside the compact arc chamber. The Clampmatic spring assembly assures a bolt-tight contact, helps speed "break". This combination guarantees positive and safe operation, long switch life.

You emphasize safety when you choose Bulldog Power Panels with Vacu-Break* switch units! Exclusive Vacu-Break design houses contacts in compact arc chambers that limit the oxygen supply . . . actually starve the arc before it can explode and pit or burn contacts. Maintenance is practically eliminated.

Contacts in the Vacu-Break unit are attached directly to the operating handle for positive, safe switching every time. When the handle is in the OFF position—you know the switch is off! For extra safety the

units have interlocking doors. The Vacu-Break unit also provides clamped-pressure switching contacts to prevent overheating. Clampmatic* design simulates a *bolted connection* when in the ON position . . . accelerates the break, too!

In recent tests, Standard Bulldog switches with Amp-Traps** were subjected to 100,000-amp short circuit current. They were undamaged! You provide this extra safety and long-lasting performance by specifying Bulldog Vacu-Break Power Panels.



BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
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In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

*Vacu-Break and Clampmatic are registered trademarks of the Bulldog Electric Products Division. **Amp-Trap is a registered trademark of the Chase-Shawmut Company.

CHASE tapes stack up best for every job!

For splicing, binding or insulating, men who *know* rate Chase Friction, Rubber, Plastic, Neoprene and Butyl Tapes tops for on-the-circuit performance. See for yourself . . . buy and try several rolls today!

Chase & Sons Inc., 26 Spruce Street, North Quincy, Mass.

A resistor in each leg of the two test leads prevents shocks.

Six feet of cord are used to plug into a 120-volt outlet, and the four components are mounted on a piece of asbestos paper or asbestos building shingle. Their own leads hold the components via holes made in the asbestos. One of the 8-in. test leads terminates in an alligator clip; the other in an insulated probe. A knot is tied in the cord where it enters the case and in the two test leads to prevent strain on the components to which they're soldered.



DRILL PRESS with speed-reduction gear, and bearing plate fitted with L-shaped supporting buttons permits reaming of motor end bells in shop of Electric Motor Service, Kennett Square, Pa., without necessitating the lowering of the spindle to the actual point of contact with the press baseplate. Low-speed drill materially lengthens life of drill, while use of holding buttons insures end bell being supported firmly and in level position.



ELECTRIC EQUIPMENT CO., Bridgeport, Conn., never has to worry about inventory shortages, since separate bins for all separate parts facilitate rapid checking of stock levels. "Caught in the act" of performing this check is owner Herman Kessler who keeps personally up-to-date on all shop-essential operations and methods.

No trouble calls with PUSHMATIC



*Every breaker is
individually performance tested*

Browse along our production line and it will be apparent why this circuit breaker has earned the reputation as the safest and most dependable on the market. Following are five of the dozen or more exhaustive checks and quality controls the Pushmatics undergo — over and beyond those required by Underwriters'.

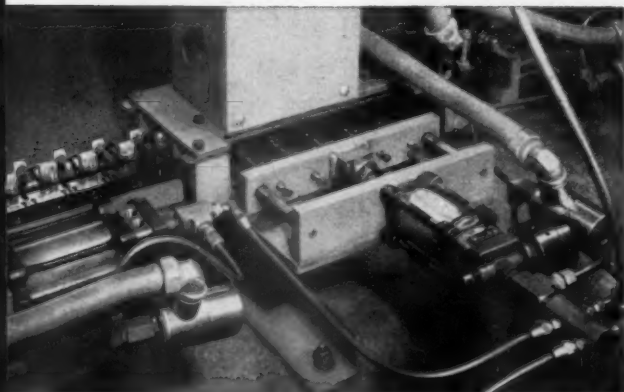


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I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

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1. CALIBRATION In a dust-free room, where temperature is maintained at a constant 75°, operators calibrate *every* Pushmatic bi-metal assembly on a special optical viewer. Each bi-metal "latch" is adjusted to a dimensional accuracy of 1/1000 of an inch. Prior to this, the bi-metal had been heat-treated in an inert atmosphere to relieve stresses, "normalize" the metal.

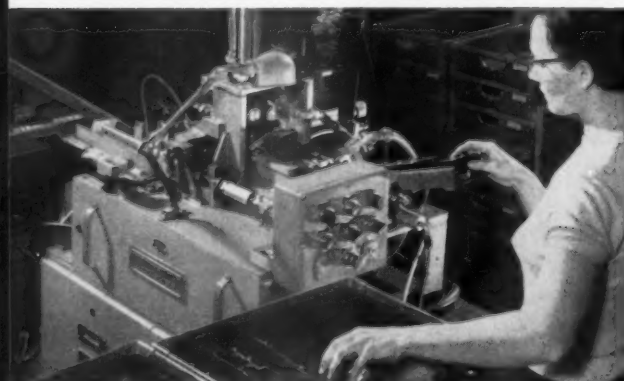


2. MECHANICAL BREAK-IN After assembly every Pushmatic is operated 50 times to make absolutely sure it functions well mechanically. Ten break-ins would be adequate . . . the extra 40 give you that much more assurance that it will never fail in manual or automatic operation.



3. CALIBRATION UNDER LOAD Brought back to its "set" temperature, each breaker is checked at 200% of rated current, and again at the equivalent of 125% of rating. Check Boards are accurate to 1/10 of a second. Samples from each production run are also tested at 100% of rating.

4. SHORT CIRCUIT TEST Being thermal-magnetic devices, Pushmatics then undergo severe short circuit currents to test the instantaneous trip time of the magnetic element. If a breaker fails to trip within .02 seconds, it is automatically rejected by the machine. Extra safety, extra performance.



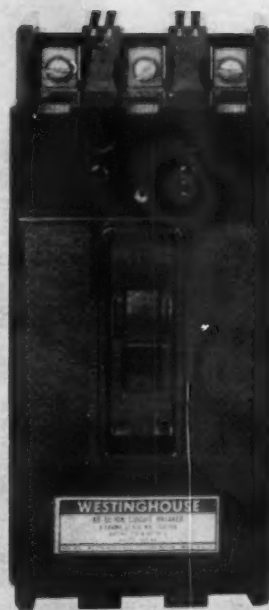
5. ENDURANCE TEST Underwriters' Laboratories run periodic endurance tests on BullDog Pushmatics®. The requirement — 10,000 operations, 6000 under load and 4000 with no load. But BullDog constantly checks out the breakers at 50,000 or more operations. *End trouble calls. Use Pushmatic!*



WHO ELSE MAKES THIS MANY TYPES OF CIRCUIT BREAKERS?



TRI-PAC†
current-limiting breaker for 100,000-amp faults



THERMAL-MAGNETIC
the industry standard

NOBODY BUT WESTINGHOUSE! It's true! Only Westinghouse offers you six complete lines* of circuit breakers—to solve six different kinds of circuit protection problems.

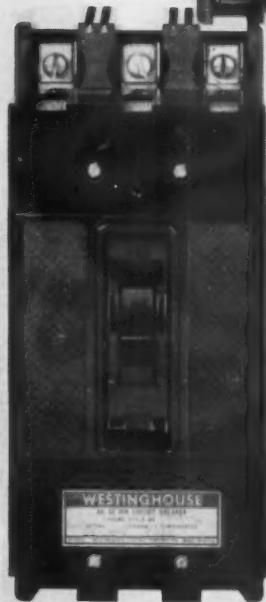
Here's what that means to you: You don't have to accept any "cure-all" type of breaker for your special applications. You can get the right breaker—designed by Westinghouse to do just that special job.

And these aren't high-priced "special" breakers. They're Westinghouse

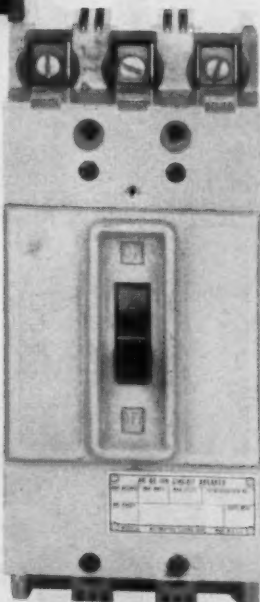
*Three of these breaker lines are Westinghouse exclusives!—(Saf-T-Vue,† Ambient-Compensated, MARK 75†)

†Trade-Mark

SAF-T-VUE
see the contacts are open



AMBIENT-COMPENSATED
for operation in changing ambients



MARK 75
75,000-amp interrupting capacity!



FRONT-ADJUSTABLE
change the setting with a screwdriver

standards—available now in most any frame size, rating or interrupting capacity—in literally thousands of combinations.

We suggest that next time you've got a problem involving circuit protection, call on Westinghouse. Chances are the answer is already in our warehouse. For further information on industry's only complete line of circuit breakers, please contact Standard Control Division, Westinghouse Electric Corporation, Beaver, Pa. Or call your nearby Westinghouse sales office.

J-30263

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS



AND NOW... WESTINGHOUSE GIVES YOU NEW ENCLOSURES

for industry's only complete line
of circuit breakers

New breakers! New enclosures! Both from Westinghouse!! This new line of Westinghouse AB-I breakers is designed to hold *any* of the six basic lines of Westinghouse circuit breakers described on the preceding two pages. Mark 75—Ambient-Compensated—Tri-Pac—Front-Adjustable—Thermal-Magnetic—Saf-T-Vue—*any* of them!

It means almost unlimited versatility for your AB-I installations. You can get 100,000-amp interrupting capacities, visible contacts, ambient compensation...all with this new line of Westinghouse AB-I breakers.

These new enclosures are a cinch to install, too. They've got wide wiring gutters, well-placed knockouts and side-hinged covers. A neutral pad, already drilled and tapped, accepts a complete range of neutral bars to make field installation a cinch.

There's also an optional safety interlock (see below) that automatically holds the breaker handle "off" when cover is opened. And a new trunk latch on the cover for an easy-to-close, dustproof seal.

Whether you wire these new AB-I's yourself—or supervise the men who do—you're going to appreciate the time savings and adaptability of this all-new AB-I lineup.

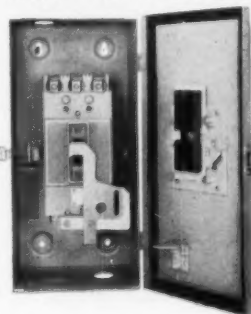
For additional information, please contact your nearby Westinghouse sales office or distributor. Or write to: Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

J-30267

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

Westinghouse EXCLUSIVE
— safety interlock available as low-cost optional!



Westinghouse with six



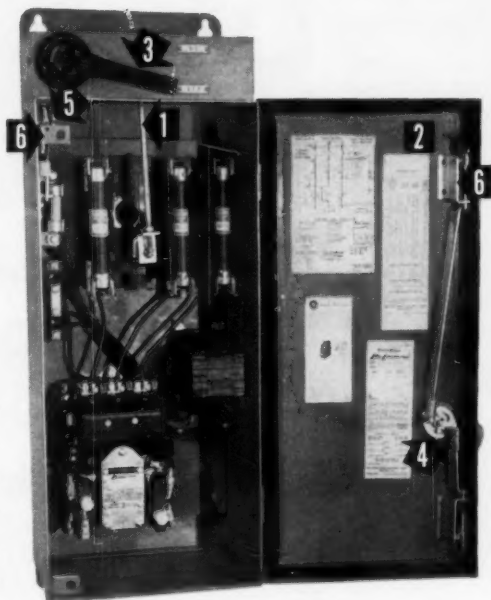
develops new motor starters "monkey proof" safety features

Westinghouse NEMA 12 Life-Line combination starters end unauthorized tampering, offer greater safety and convenience to service personnel

Check these six great new safety "firsts"...

1. The disconnect is permanently attached to handle. On-Off handle is not disengaged by opening the door.
2. Door must be fully closed and sealed before On-Off handle will operate disconnect. (See point 5, below.)
3. Operating mechanism can be padlocked to prevent operation.
4. Door opens simply, easily with tool (screwdriver). Cannot be opened with bare hands alone.
5. If desired, On-Off handle and disconnect can be operated with door opened. To operate, simply depress safety release.
6. Interlock assembly will not allow door to be opened while handle is in ON position. Removing spring from assembly will permit this if desired.

J-30273



... plus these extra important features, at no extra cost!

- NEMA 12 dustproof enclosure meets all JIC and other heavy industry specifications.
- Molded nylon handle for increased impact strength.
- Provision for padlocking door and handle.
- Tilted top to drain liquids away from door seal.
- Adjustable tie-rod between handle and disconnect to allow either switch or circuit breaker.
- Available in four standard sizes, from 1 through 4.
- Adequate internal wiring space.
- Extra space for third and fourth overload relays and excess capacity transformer.
- Auxiliary contacts can be field mounted in Visi-Flex* disconnect switch.
- All parts and complete panel removable from front.
- Components available for custom panel construction.

*Call your local Westinghouse representative or distributor now, or write
Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.*

*Trade-Mark

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS"

CBS TV MONDAYS

Westinghouse with six



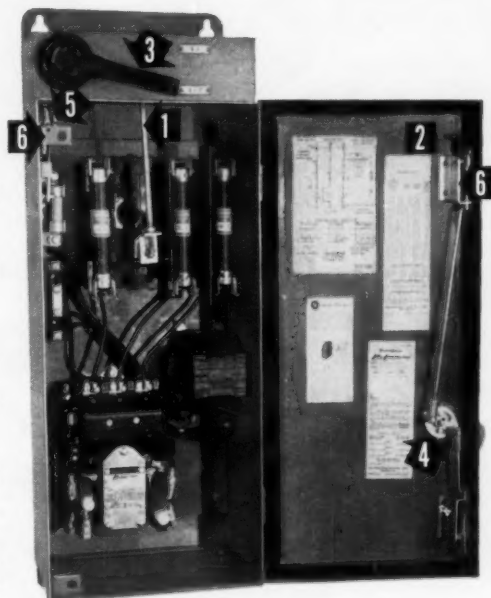
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4. Door opens simply, easily with tool (screwdriver). Cannot be opened with bare hands alone.
5. If desired, On-Off handle and disconnect can be operated with door opened. To operate, simply depress safety release.
6. Interlock assembly will not allow door to be opened while handle is in ON position. Removing spring from assembly will permit this if desired.

J-30273



... plus these extra important features, at no extra cost!

- NEMA 12 dustproof enclosure meets all JIC and other heavy industry specifications.
- Molded nylon handle for increased impact strength.
- Provision for padlocking door and handle.
- Tilted top to drain liquids away from door seal.
- Adjustable tie-rod between handle and disconnect to allow either switch or circuit breaker.
- Available in four standard sizes, from 1 through 4.
- Adequate internal wiring space.
- Extra space for third and fourth overload relays and excess capacity transformer.
- Auxiliary contacts can be field mounted in Visi-Flex* disconnect switch.
- All parts and complete panel removable from front.
- Components available for custom panel construction.

Call your local Westinghouse representative or distributor now, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

*Trade-Mark

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

NEW COOL SOLA SLIMLINE BALLAST

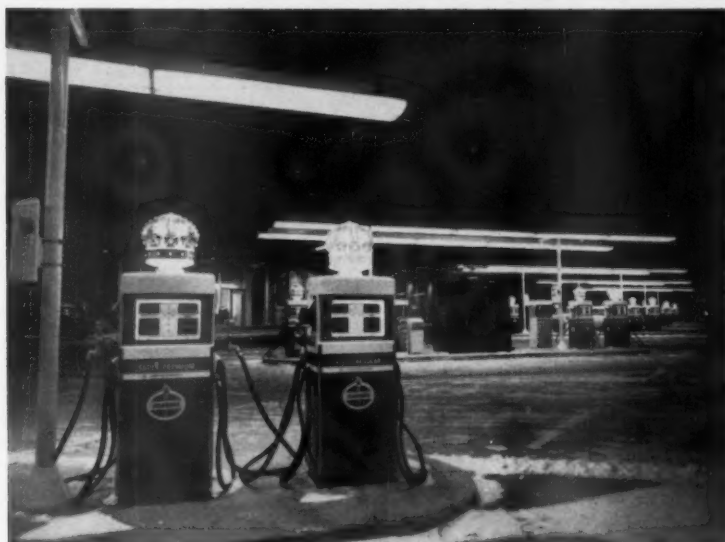
***Sola ballasts guard your reputation
with coolest coils and capacitors,
easily pass "in-fixture" heat tests***

Sola's new 650-110 ballast for two F96T12 or two F72T12 slimline lamps offers premium performance at only slight additional cost. This new CBM-certified ballast was tested in a totally-enclosed, four-lamp fixture mounted against fibrous acoustical material. Room ambient was 25°C. Maximum temperatures recorded were: case "hot spot" 86°C, capacitor 70°C. Each temperature was well within insulation limits and U.L. fixture requirements. Sola outperformed competitive, premium-priced ballasts tested under these same severe conditions. (Request Bulletin FL-356 for details and test results.)

Men who install, furnish, or specify fixtures know that "in-fixture" ballast performance is what really counts to the man who's buying the light and who insists on every lumen he's paying for. They know that Sola's all-CBM-certified ballasts give trouble-free, cool, efficient service . . . full light output and full ballast life.

Fixture manufacturers are invited to evaluate this new, cool slimline ballast (Cat. No. 650-110) in their own fixtures. Request test samples or Bulletin FL-356 from ***Sola Electric Co.***, A Division of Basic Products Corporation, ***4633 W. 16th Street, Chicago 50, Illinois***

Practical Methods



OVERALL NIGHTTIME VIEW of an actual service area illustrates the high levels of illumination provided by huge 40-ft fluorescent fixtures mounted over station's gasoline dispensing islands. Plexiglas enclosures are tightly sealed to guard the fixture against the elements.

Daylight Brightness for Toll Road Service Stations

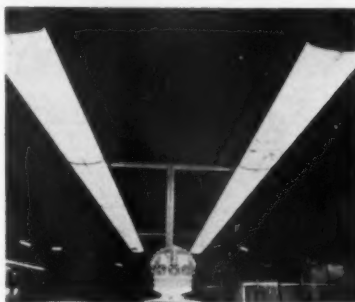
LIGHTING

Fluorescent light fixtures installed over gasoline dispensing islands provide uniform "daylight" brightness at five auto service areas on the new Illinois Tollway.

Designed to blend in with the futuristic Tollway architecture, the fixtures incorporate simple, modern lines with high white-light intensity that provides approximately 120 fc of illumination for island pumps and merchandise displays. They also furnish uniform levels of illumination for concrete aprons between the islands.

Measuring 40 ft by 10 ft, and weighing 2,100 lbs, each fixture contains 20 Power Groove fluorescent lamps. A total of 50 fixtures are used to meet the lighting requirements of the five service areas since each area has two complete service stations that contain five pump islands per station.

Each fixture, composed of two rows of 8-ft 2-lamp luminaires (five in each row) has a total of 4,700 watts. Plexiglas enclosures securely sealed guard the fixtures against moisture, wind, dust and insects. The Plexiglas, besides protecting the fixtures from the elements, has



CLOSE-UP OF GIGANTIC FIXTURE units measuring 40 ft by 10 ft. Unit pictured here is typical of those used over pump islands at five auto service areas on the new Illinois Tollway. Components of each fixture consist of two rows of 8-ft luminaires (five fixtures in a row) mounted to U-shaped channels supported by T-shaped island poles.

excellent light transmission quality as well as excellent diffusing ability. This results in low light absorption, plus reducing hot spots to a minimum. The two rows of 8-ft luminaires in each fixture are connected to 38-ft lengths of U-shaped channeling. The 550-lb channels, aside from serving as a supporting media, are used to house the fixture's ballasts. The channels also act as a raceway for each lighting unit's circuits and switchlegs.

Two 12-ft, 4-in. diameter extra heavy steel T-shaped poles rise from

each pump island to act as the basic means of support for the 40-ft fixtures. The horizontal cross arms of the T-shaped poles are fastened to the 38-ft runs of U-shaped channeling that hold individual rows of 8-ft luminaires. Using only two support poles per island eliminated the "forest" appearance while also allowing additional space for merchandise racks between pumps. To supply extra rigidity, each pole is equipped with gussets (L-shaped anchor bolts) welded to its base plate. Both gussets and base plates are concealed in a conically shaped canopy.

Hinges designed to prevent accidental opening by gusty winds can be easily opened manually for lamp replacement and service checks. Selector switches mounted in service station offices enable attendants to turn on each fixture's lamps separately.

The lighting units were shipped to the job disassembled, but assembly at point of installation was simple. One of the assembly features is a luminaire connector that plugs into the fixture's upper structure channeling.

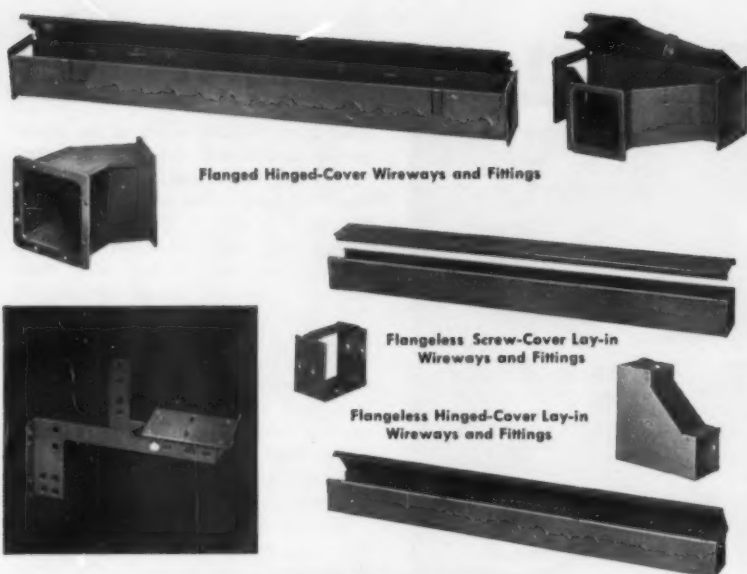
The fixtures were designed and manufactured for the exclusive use of the Standard Oil Company of Indiana by Petelco, Inc. of Broadview, Ill. Electrical contractor who made the installation was the Hultgren Electric Company of Chicago.

Flashlight Detects Buried Conduit

INSTALLATION

A simple flashlight has been used to advantage by electrical contractor Charles Thom of Fairbault, Minn., to avoid damaging concrete-embedded conduit by portable drills, air hammers or chisels. Construction work frequently requires concrete to be drilled or opened for anchoring of equipment, etc., not provided for in the original plans. If accurate records have not been kept of conduit runs, the raceway can easily be pierced and damage done to any enclosed conductors.

A flashlight mounted to the drill or to an accessible conduit stub, panelboard or outlet box and connected as shown in the accompanying sketches will light up should the



Flanged Hinged-Cover Wireways and Fittings

Flangeless Screw-Cover Lay-in Wireways and Fittings

Flangeless Hinged-Cover Lay-in Wireways and Fittings

It pays to figure on **KEYSTONE** wiring installation equipment

You name it—Keystone has it! Here's the most complete line of quality wiring installation equipment available—anywhere! All sizes, shapes and types of U.L. listed wireways and auxiliary fittings, cabinets, boxes and enclosures—all easy to install and maintain, too. What's more, when you're faced with a special job that "standards" just can't handle—then Keystone will quickly provide custom enclosures to meet your exact needs!

In addition, you'll save time when you specify Keystone—because coast-to-coast regional warehouses assure you of getting *what* you want, *when* and *where* you want it!



Type SC and FC
Screw-Cover
Pull Boxes



Type A Hinged-Cover
Surface Cutout Boxes



Single and Double Door
Current Transformer Cabinets

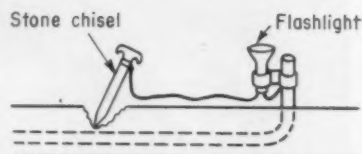
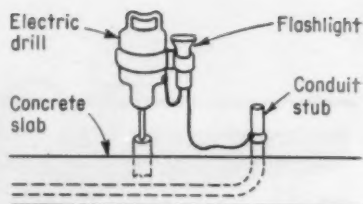


Type PF and PS Telephone Cabinets

3 NEW CATALOGS—Contain complete information on the entire Keystone quality line. Send for your free set today!



KEYSTONE MANUFACTURING COMPANY
23338 Sherwood Avenue • Warren, Michigan



FLASHLIGHT CIRCUIT is closed if drill or chisel touches conduit, warning operator to stop drilling.

tool make contact with the buried conduit. The drilling can be stopped immediately before serious damage is done to the raceway.

Portable Parts Cabinets Cut Installation Costs

TOOLS

On large construction projects, or whenever several mechanics are employed on a job, a great deal of time can be consumed "chasing" after small parts and tools.

Kelso-Burnett Electric Company of Chicago has eliminated this problem by building up a fleet of mobile parts cabinets which they use on almost all of their jobs.

The units, which are 4 ft long by 2 ft wide by 4 ft high are built onto conventional flat trucks that have four 6-in. rubber tired wheels. The cabinets are constructed of $\frac{3}{4}$ -in. plywood built around a metal framework. The tops of the cabinets are made of 2 by 10 lumber, as they are often used as work benches. Four all-metal pull-out type drawers are built into the left side of each unit, while the right side is divided into shelves enclosed by a single swing-out type door. Each unit is painted, stenciled with the company's name and address, and numbered. All drawers and doors are fitted with locks to prevent access to contents by unauthorized personnel.

The portable parts cabinets, which hold an assortment of hand tools plus small material parts such as bolts, nuts, locknuts, washers, connectors, fixture fittings, etc., are replenished each morning from the job's central stock area. Because of their mobility feature, the units can be rolled from room to



Note how ordinary EMT split early in pressure test while induction welded CIRTUBE EMT (shown here unplated) held fast, surpassing UL requirements.

BETTER WELDING

on new CIRTUBE EMT means easier, split-free bending



THERE are many reasons why new CIRTUBE EMT will help you get faster, cleaner wiring jobs. Most of them are listed here.

One *big reason*, however, is *continuous induction welding*—by far the best technique available for making bead-free, split-free welds on high quality EMT.

It is virtually impossible to split an induction-welded EMT no matter how severe the bends. And the perfectly clean weld means uniform roundness—easier, neater bending without the slightest kink or flattening. Your men get it right the first time around.

Try induction-welded new CIRTUBE EMT soon as you can. Your wholesaler has it now—bundled with distinctive orange colored tape to identify the EMT manufactured to Circle's quality standards.



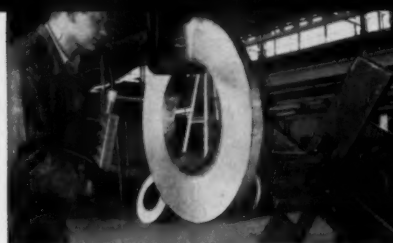
CIRCLE

WIRE & CABLE
a subsidiary of
CERRO DE PASCO
CORPORATION

PLANTS: Maspeth and Hicksville, N. Y. SALES OFFICES & WAREHOUSES: in all principal cities
RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

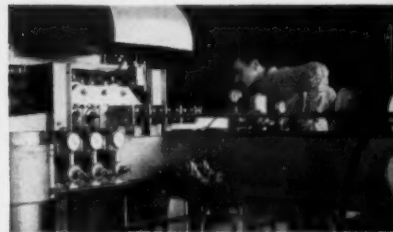
CIRTUBE EMT

Ask for it!



Proper steel plus! The best cold rolled steel plus the right handling give CIRTUBE EMT its natural bendability.

Easy fishing! A baked-on protective coating gives CIRTUBE EMT a built-in lubrication for easier wire pulling.



Lifetime exterior finish! Hard galvanized finish for durability; polished satin lustre for lasting good looks.

Automated quality control! Automatic controls assure complete and continuing uniform quality of product.



Tight, easily handled bundles! Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

Fast, friendly service! Well-known Circle service through a nation-wide network of well stocked nearby warehouses.





FLUSH MOUNTING

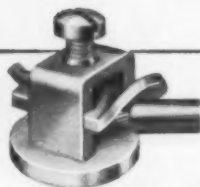


SURFACE MOUNTING

ROYAL ELECTRIC RECEPTACLES



NOW... WIRE RANGES and DRYERS *Faster*



Heavy duty screw staked to clamping pad for quick, positive action of the pad either up or down —

Shipped with screws backed out, ready for instant wiring; just insert the conductor and tighten the screw!

EASIER, FASTER, SAFER WIRING!

Surface Mounting	Flush Mounting
Black or Ivory	Brown or Ivory
RANGE: Cat. No. 606	RANGE: Cat. No. 610
50 Amp-250V	50 Amp-250V
DRYER: Cat. No. 607	DRYER: Cat. No. 611
30 Amp-250V	30 Amp-250V
Unit Pack: 1	Unit Pack: 1
Ship. Carton: 10	Ship. Carton: 10

Deluxe Chrome Wall Plates

Cat. No. 316 grounding
Cat. No. 317 non-grounding
Fit standard 2-gang boxes
In individual envelopes,
10 to a carton, 50
to a shipping carton

You save time and trouble on every installation when you use Royal Range and Dryer Receptacles with the exclusive "Vise-Grip" terminals. "Vise-Grip" assures positive connections every time... for FULL, NO-ARC power to the appliance.

No receptacles can "out-feature" Royal — with heavy duty, double-wipe spring contacts, sturdy phenolic body, and self-finding slots. Want details? Ask your wholesaler, or write for catalog, giving wholesaler's name.

ROYAL ELECTRIC CORPORATION
PAWTUCKET, RHODE ISLAND

ROYAL
ELECTRIC
...an associate of **ITT**



PORTABLE PARTS CABINET employed by the Kelso-Burnett Electric Company on most of their construction projects holds a variety of small material parts and hand tools. The top of the unit is constructed of 2- by 10-in. lumber so that it may also be used as a work bench. Locks are fitted to each cabinet to prevent access to contents by unauthorized personnel.



another or spotted anywhere in a building; therefore electricians don't have to wait for important parts or tools and can remain at their positions longer. It was found that this often reflects a considerable saving in total installation time besides lessening the fatigue of walking back and forth for needed items.

Two Electric Methods Heat School

ELECTRIC HEATING

The Sam Case elementary school just completed in the coast city of Newport, Ore., offers a preview of the immediate future in electric school heating. One of the largest schools in this area to go all-electric, the Sam Case school is heated by a combination of Swan electric base-board heaters and Chromalox



The Port of Portland's extreme reliability requirements are met by S&C's Fused Interrupter Metalclad Switchgear with S&C Automatic Transfer Panel and Moto-Draulic Operators

Nation's newest jet-age terminal gets modern S&C Metalclad Switchgear



8-Bay assembly of S&C Metalclad Switchgear contoured to fit location at Portland International Airport.

Consultant on high-voltage electrical equipment: George A. Drewett, area engineer for Pacific Power & Light Co.

Extreme reliability of electrical services is a major requirement of the modern jet-age airport, because of the great number of vital radar and lighting needs.

Pacific Power & Light's staff studies showed that this high degree of reliability suggested the use of fused interrupters metal-enclosed, with an integral automatic transfer panel controlling operators for preferred-to-emergency switching.

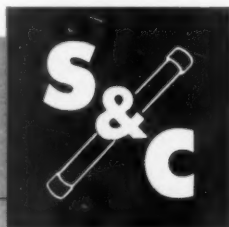
Result: Modern S&C Metalclad Switchgear was specified. The power circuits of this modern new airport are run in conduits or protected cable trays, and so are free from transient faults. The proper protection against the only

type of fault which is likely to occur—a permanent fault—is the Power Fuse as employed in S&C Switchgear.

To maintain continuity of service, the installation uses S&C Load Interrupters actuated by a Moto-Draulic Operator which is controlled in turn by an S&C Automatic Transfer Panel. This modern equipment meets new, modern standards of reliability, and at the same time saves as much as 50% in capital outlay for switchgear.

For information, write S&C Electric Company, 4433 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

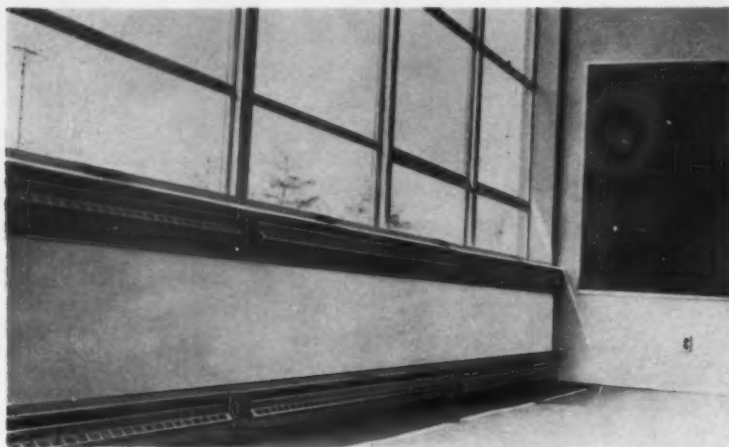
Specialists in
High-Voltage
Circuit Interruption
for Utilities
Since 1910



METALCLAD SWITCHGEAR



ELECTRIC HEATING throughout this elementary school in Newport, Oregon, employs one method for heating and ventilating during the day and another method for maintaining temperature during the night.



BASEBOARD HEATERS are stack-mounted under windows in classrooms to provide Btu at night to hold desired temperature.

forced air duct heaters. Plans call for the Swan heaters to maintain desired room temperatures from four p.m. to eight a.m., at which time they go off, and fresh ventilated air is heated by a series of Chromalox heating coils during classroom hours.

Inadequate ventilation, chief complaint of electric space heat for school use, according to Ray Preston, electrical design engineer for the project, has been solved with minimum cost by combining thrifty strip with centralized blowers for fresh air ventilation.

Preston gave as reasons for the use of electric heating: Favorable local electric rates, the elimination of space required for a boiler room and the saving of the custodians' time in cleaning and servicing of a boiler. The installation of conduit and wiring is more economical than steam piping. The low capital investment of electric heating and its inexpensive maintenance costs were prime considerations in determining the heating medium.

The Sam Case School offers a case in point to show how a local utility can spark the use of electric heat. Local public utility officials met with members of the Lincoln County School Board during planning stages to emphasize the economy, cleanliness and, in particular, the safety of an electrically heated school compared with a school using combustible fuels. School board members were sufficiently convinced to underwrite plans that called for electric heat exclusively.

Specifications are as follows: The school contains 33,480 sq ft being built at a cost of \$10.21 per sq ft. There are 18 classrooms (each measuring about 30 ft square), one 56- by 40-ft multi-purpose room which houses gym, cafeteria, and auditorium, and the administrative area.

In order to obtain sufficient wattage in the 28-ft space available under the classroom window sills, 2 rows of Swan strip heaters were installed. A maximum of 15 kw was installed in the rooms with exposed

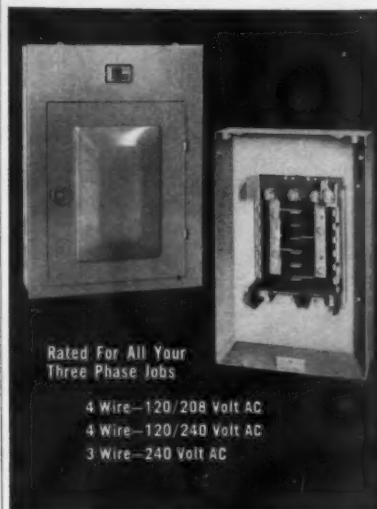
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NEW PRODUCT NEWS

Three Phase "MP" Load Centers

12 to 42 Circuits

100 & 200 Amps



Rated For All Your
Three Phase Jobs

4 Wire—120/208 Volt AC

4 Wire—120/240 Volt AC

3 Wire—240 Volt AC

Now you can put up three phase installations using Murray "MP" fully magnetic breakers and load centers throughout.

These new load centers contain all of the well known easy-to-wire features of the regular Murray line.

Boxes will accommodate any combination of one, two or three pole breakers—have U.L.-approved connectors for copper and aluminum conductors. Also neutrals or neutral main lug on top, plaster line adjustments, shallow box construction—everything you need to put in easy, neat installations.

Ask for "MP" three phase load centers at your Murray wholesaler's. Murray Manufacturing Corp., 1250 Atlantic Ave., Brooklyn, N. Y.

murray



Best
protection
against
flash
shorts?

*... next time try fully magnetic breakers,
like the Murray "MP" — no thermal element!*

There's nothing new about protection against flash shorts. "MP" breakers have provided it for years with *fully* magnetic operation. And without "thermal" inconvenience!

Reason: "MP" breakers work only on current — not heat. Look at the advantages! No nuisance tripping due to overheating, no profit-eating trouble calls, no de-rating, no installation problems.

Jobs go up faster, better, easier — more profitably.

Only "MP" Breakers Give You All These Advantages!

No other quality plug-in breaker can match these features: *fully* magnetic protection at all overloads, unaffected by heat. Also tungsten silver contacts, built-in

time delay, immediate resetting — and many others.

Plus Full Selection Of Boxes To Fit Any Job!

Main lugs and main breaker disconnect, single and three phase, split bus — 2 to 42 circuits. Boxes contain neutrals on top, plaster line adjustments, U.L.-approved connectors for copper or aluminum conductors, shallow box construction, sequence bussing — all you need for quick, efficient installations.

You can't ask for a better breaker than the "MP" — still competitively priced. Next time you order, ask for "MP" breakers: imitated . . . but never equalled. Murray Manufacturing Corp., 1250 Atlantic Ave., B'klyn, N.Y.

FULLY MAGNETIC "MP" BREAKERS

"Imitated . . .
but never
equalled"



Conduit Holes in Seconds with Greenlee Hydraulic Punch Driver



for all sizes of conduit up to 5"

Here's the fast, cost-cutting way to enlarge knockouts or make entirely new openings for conduit up to 5". With a few easy strokes of the handle the GREENLEE No. 7646A Hydraulic Knockout Punch Driver punches through metal up to 10-gauge. Makes hole-cutting in tight, cramped quarters far easier . . . no wrench space needed. This lightweight, portable unit is designed to drive all standard GREENLEE knockout punches for 1/2" through 5" conduit. Comes to you complete with hydraulic pump, hose, ram, adapter screws, and die sleeves in metal carrying case. Ask your distributor for a demonstration of this timesaving tool, or write for Bulletin E-274.

Wide choice of sets with Hydraulic Driver and Greenlee Knockout Punches

Set No. 7310 (right) — Driver and set of 10 GREENLEE Knockout Punches for 1/2" - 4" conduit. Two metal cases.

Set No. 7306 — Driver and set of 6 GREENLEE Knockout Punches for 1/2" - 2" conduit. Metal case.

Set No. 7304 — 4 GREENLEE Knockout Punches for 2 1/2" - 4" conduit. Metal case. Knockout Punch No. 743 — For 5" conduit.



A COMPLETE LINE OF KNOCKOUT TOOLS, HAND OR HYDRAULIC PUMP OPERATED

GREENLEE TOOL CO.

1756 Columbia Ave., Rockford, Illinois



Kilowatt consumption for the Sam Case School:

	Connected Load	Peak Load
Lighting	109 kw	97 kw
Appliances	91	57
Motors	12	12
Space Heating ...	521	367
Hot Water	27	27
Range	21	15
Total	781	575

A 60-kw diversity provides a 515-kw load at transformers. Metered peak demand should not exceed 425 kw.

side walls. The strips are arranged in sets, top front, bottom front, and connected in U shape for rear. Each set of strips has an individual strip thermostat at floor level. The feed is 208-volt single phase, but controlled from a clock-operated contactor on balanced 3-phase circuits. The strip thermostats are set in sequence approximately 3° apart with top front off first.

Clock control begins at 4 p.m.; the heaters go on in each classroom upon the thermostats calling for heat and throughout the night to maintain temperature. The clock controls are arranged for differential time of operation for the north and south exposure of the buildings.

During the school session hours, the tempered ventilated air with six changes per hour, the activity of 25 children, and the 3.6 kw of incandescent lighting will maintain comfortable air conditions in the classrooms. The offices and administration areas use individual strip thermostats for manual control because of usage in other than school session time. The ventilated air system is controlled for heat by an exterior thermostat operating the eight 20-kw heaters in the plenum chamber in sequence. The air temperature is designed for approximately 75° at the room grille.

Incoming fresh air is blown past a series of Chromalox forced air duct heaters located in a tunnel running the length of the school. The tempered air system operates continuously while classes are in session using either 100% new air or recirculating return air. One 8-section, 160-kw element goes on in steps to heat classrooms. For classrooms, Btu input is estimated at 1,166,245; loss is estimated at 829,860 Btu.

The multi-purpose room has a ventilated air system installed adjacent to the stage, which operates four 25-kw heaters with a control similar to the tunnel ventilating unit. The clock control prevents the

two ventilating systems from superimposing the larger kw demands on the strip heater power.

All electric wiring and forced air heating elements are enclosed in the tunnel. Time switches control all heating operations. Linco Electric, Albany, Ore., was the electrical contractor.

Multi-Outlet Baseboard For Apartment Wiring

CIRCUIT LAYOUT

A new branch circuit wiring system is installed in the Pavilion Apartments, part of an extensive housing project in Detroit, Mich. Here, a multi-outlet raceway assembly is used as baseboard in the apartments.

The electrified metallic baseboard is called "Baseduct" and has multi-outlet facilities with an integral wiring space for easy installation and ready rewiring or servicing. The complete system of convenience receptacles is accessible without disturbing the plaster walls. No wires are run in the wall.

This new layout technique offers unusual convenience to tenants in the utilization of cord-connected lamps and other appliances. The system eliminates the need for long extension cords and other unsightly and often dangerous external modifications of receptacle circuits. Circuit overloads are discouraged by this system, and complete freedom is provided in the arrangement of furniture.

Installed, the Baseduct system, which was developed by National Electric Products Corp., provides an outlet every 5 ft. And its gray finish will match most decors or can be painted any other color.

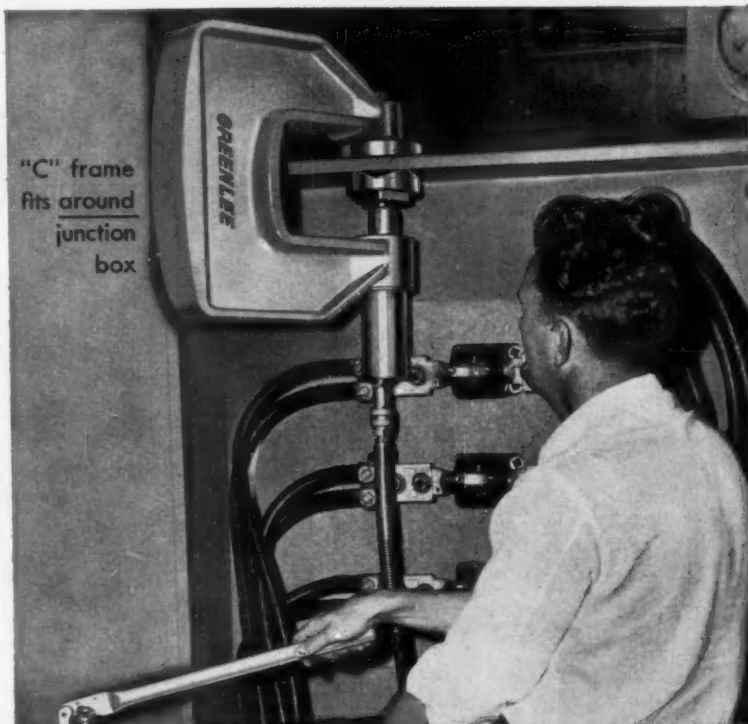


INSTALLATION EASE was a feature of the multi-outlet baseboard system in Pavilion Apartments. The wiring harness with receptacles is assembled and placed in the raceway (at left); then the installation is completed by snapping the raceway cover in place (at right).

NEW One-Shot

Hydraulic Knockout Punch Drivers

Punch Holes for 1/2" - 4" Conduit



no pre-drilling or step-up punching!

Save many dollars on conduit installations with the new GREENLEE One-Shot Knockout Punch Driver. Lightweight, easy to carry, powerful! Fast one-man setup and operation. 8" deep throat lets you position punch exactly where needed. High-strength aluminum "C" frame provides ample rigidity for slicing through 10-gauge steel with a few strokes of the hydraulic pump. No waste motions . . . fast, accurate work . . . better profits per job!

two sizes

No. 1732 (above) fits all GREENLEE Knockout Punches and Dies 1/2" - 4". Weighs only 35 lb.

No. 1731 (right) fits GREENLEE Knockout Punches 1/2", 3/4", and 1" with special dies. Weighs only 15 lb.

Both models are used with GREENLEE hand- or power-operated hydraulic pumps. Ask your distributor for a demonstration, or write for descriptive bulletin E-292.



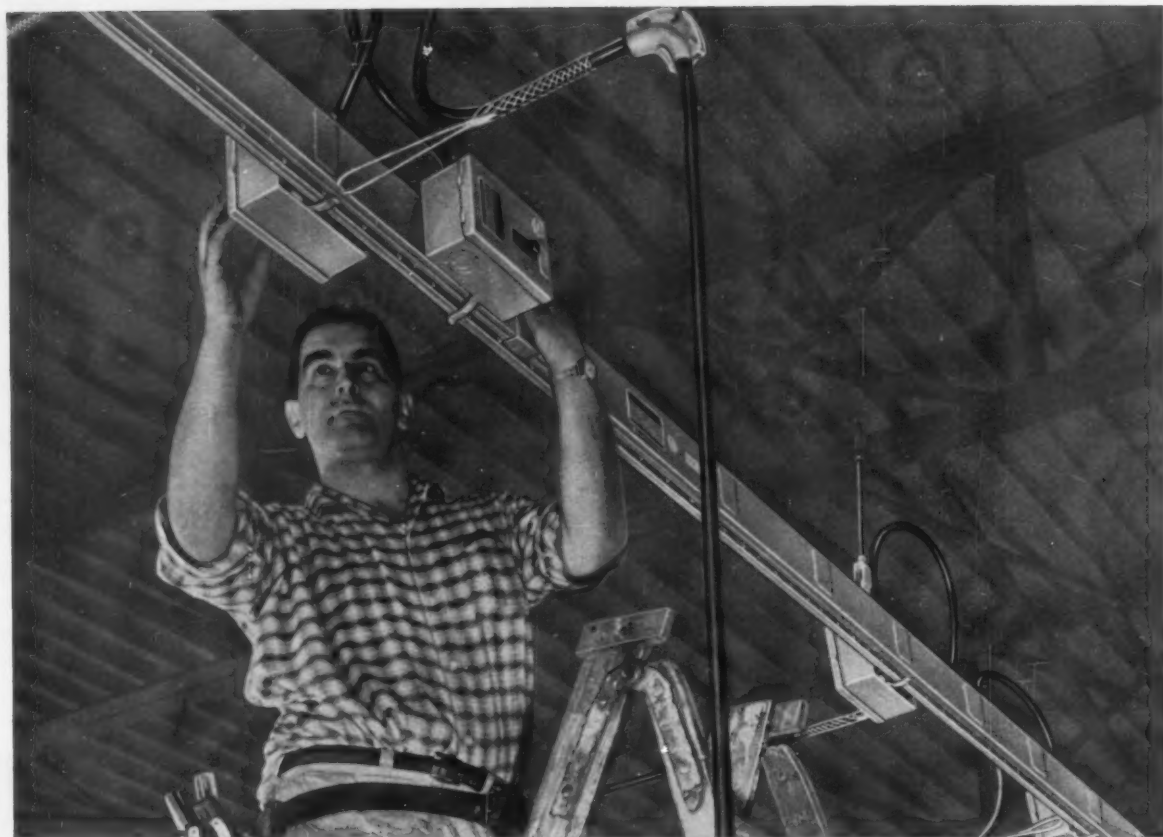
A COMPLETE LINE OF KNOCKOUT TOOLS, HAND-OR HYDRAULIC-PUMP OPERATED

GREENLEE TOOL CO.

1755 Columbia Ave., Rockford, Illinois



New G-E Plug-in installed than wire



Type DH — rated 100 amperes, 3 wire, single or 3 phase or 4 wire, 3 phase 600 volts maximum—serves as either a feeder or plug-in system and may be used indoors wherever exposed wire and conduit might be applied. It is light, sturdy and small in size (in cross-section not much larger than a pack of king-sized cigarettes).

For the facts about DH, see your G-E representative or distributor. Ask for Bulletin GEA-6172B—or write, wire or phone Distribution Assemblies Dept., General Electric Company, Plainville, Conn.

Busway costs less and conduit!

Contractors say: "If you can do the job with wire and conduit, chances are you can do it now with G.E.'s 100-ampere plug-in busway—and save 25%!"

This is not poetic license. This is straight talk about actual dollar-and-cents savings.

"With Type DH, I can save 25% over the installed cost of conduit and wire when there are four or more tap-offs in the system," are the words of a leading electrical contractor in Wilmington, Delaware.

Contractors all over the country are echoing this statement and reporting savings of this kind. Contractors, upon learning the facts, have actually switched to DH *on the job!*

The facts are simple and can be documented and demonstrated. Let us demonstrate them to *your* profit with figures, case histories, and samples!

Progress Is Our Most Important Product

GENERAL  ELECTRIC

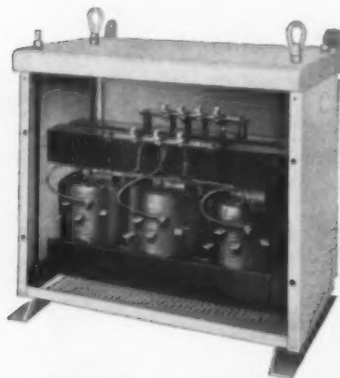
Modernize Electrical Distribution

**For more economical operation
increase feeder capacity and efficiency
by transmitting at a higher voltage**

To step down the higher distribution voltage to utilization voltage in institutional, commercial and industrial buildings it is important that high efficiency transformers are installed at load centers. **SORGEL dry-type transformers are the most practical for this purpose.** They require little or no maintenance; no liquid to check or replenish; no vault required; small and compact; easy and economical to install. Sorgel dry-type transformers provide the highest efficiency, which reduces operating costs.

Easy and Low Cost Installation

All self-contained in a single unit — either single phase or 3-phase — with simple connections to make. No separate mounting brackets or junction boxes to make or buy. Substantial wall brackets, or floor mounting base, are an integral part of Sorgel transformers. Roomy connection compartment. Solderless terminals.



45 Kva 3 phase transformer with taps. Interchangeable wall or floor mounting. Connection compartment panel removed.

Substations

The same quiet SORGEL dry-type or Askarel-cooled transformers, in ALL ratings up to 10,000 Kva and up to 15,000 volts, are also incorporated in substations. Procurable with any type or make of switchgear, and from any substation manufacturer.

Sales engineers in principal cities.
Consult the classified section of your telephone directory or communicate with our factory.

Quietest Operation

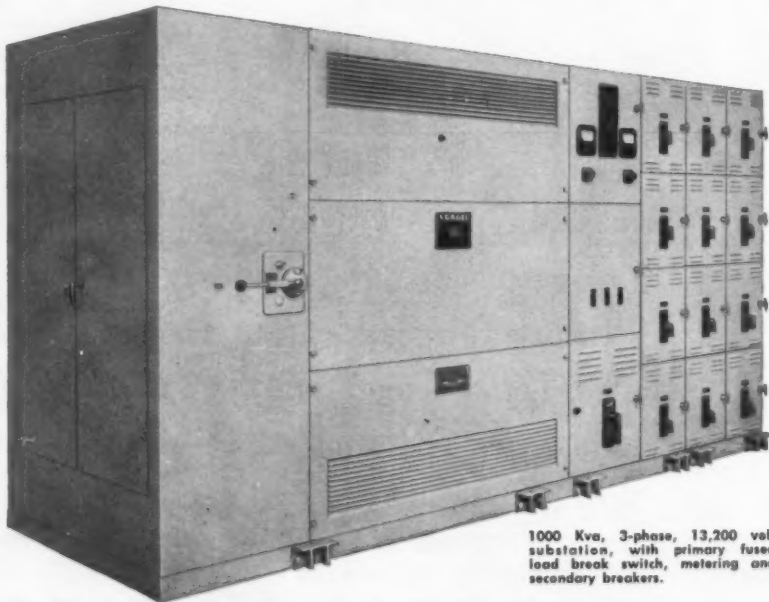
SORGEL sound-rated dry-type transformers are so quiet in operation that there is no disturbing hum. They are particularly adaptable for installation in hospitals, schools, office buildings, stores, and buildings where sound level is an important factor — as well as industrial applications. Therefore, they can be installed in almost any convenient place, inside of buildings, close to the load center. This results in shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

High Efficiency and Full Capacity

SORGEL transformers are guaranteed to carry the full rated load continuously at high efficiency. They are so liberally designed that they can carry an overload during an emergency at a safe operating temperature.

Complete Line for Every Purpose

These transformers are available in a large variety of sizes and types for every purpose. $\frac{1}{4}$ Kva to 3333 Kva single phase. 1 Kva to 10,000 Kva 3-phase. All standard voltages, such as 120, 208, 240, 277, 480, 600, 2400, 4160, 4800, 7200, 13,200, and up to 15,000 volts.



1000 Kva, 3-phase, 13,200 volt substation, with primary fused load break switch, metering and secondary breakers.

SORGEL ELECTRIC CO., 936 W. National Ave., Milwaukee 4, Wisconsin

Over 40 years' experience in the development, manufacturing and application of transformers

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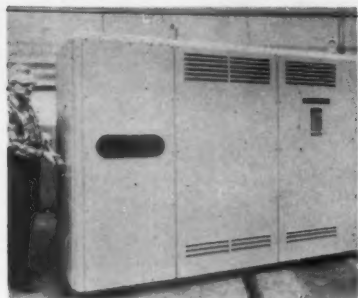
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Product News



Power Centers

(1)

Dry-type power centers now feature lower sound levels and type RM lightning arresters. External fans for additional cooling on sealed type ASL models are available. Sound levels of the new power centers range from four to nearly ten decibels below NEMA standards. These power centers are primarily used to reduce voltage in industrial plants for lighting and machine tool circuits.

Westinghouse Electric Corp., P.O. Box 2099, Pittsburgh 30, Pa.

Plastic Collars

(2)

Loose polyethylene plastic collars insulate two new malleable iron bushings. These collars insulate new bushings which are made in sizes from $\frac{1}{2}$ in. to 6 ins., and new malleable iron ground bushings with solderless lug, made in sizes from $\frac{1}{2}$ in. to 4 ins. Available also, but without insulation, is a malleable iron jumper wire bonding bushings with solderless lug.

Gedney Electric Co., RKO Bldg., Radio City, New York 20, N. Y.



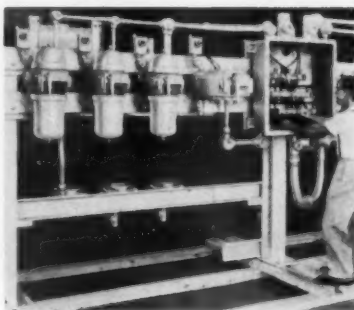
Post Top Luminaires

(3)

Post top luminaires have been designed for lighting of streets and parks. They are offered in five IES light distribution patterns—types I, II, III, II-4-way and V. They may

be used with incandescent lamps rated through 10,000 lumens or with mercury vapor lamps rated through 250 watts. They are available in natural aluminum or pastel colors with or without matching colored aluminum standards in lengths of 10, 14, or 19 ft. Mounting diameters of 3 to 7 ins. provide a means of adapting the luminaires to many new and existing ornamental poles.

Line Material Industries, South Milwaukee, Wis.



Enclosures

(4)

New rack for mounting starters in spin top enclosures, for hazardous locations, provides factory-assembled centralized motor control for chemical plants, petroleum refineries, and other locations where hazardous material is handled. Various arrangements of starters, such as back-to-back or two-tier, make spin top racks adaptable to any installation. In addition, other equipment, including circuit breakers, lighting transformers, and panelboards can be mounted. Wiring of all starters and other electrical equipment is provided to a central junction box and spin top rack is delivered completely wired and assembled.

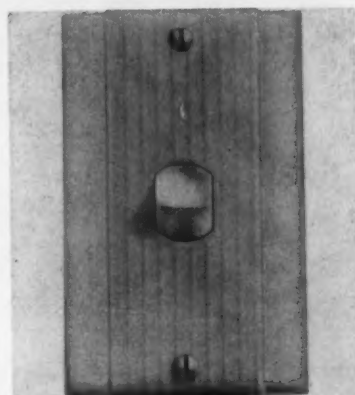
Square D Company, 4041 North Richards St., Milwaukee 12, Wis.

Ballast

(5)

An improved fluorescent lamp ballast in a single container for two 96 in. or 72 in., SHO, VHO or power groove lamps. New construction is 40% smaller and lighter. Ballast has a perfect sine wave shape with a 1.4 crest factor that assures 100% light output plus full, rated lamp life.

Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill.

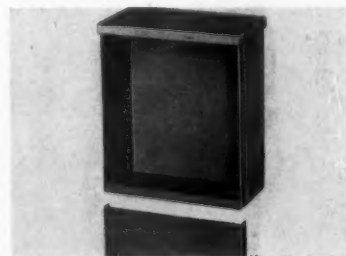


Switch

(6)

A new Rocker-Glo switch, No. 2221, which is luminous in the dark and which can be operated silently with the slightest motion, is available in Despard type with strap or Despard interchangeable, also with a narrow rocker for a tumbler switch plate. Shallow body leaves plenty wiring room in box. It comes in single or double pole, 3- or 4-way, and is rated at 15 or 20 amps, 120/277 volts, ac. Switch is available with both pressure and screw terminals. The operating member glows in the dark and works by pushing, rocking, rolling, clicking or pressing.

Pass and Seymour, Inc., Syracuse 9, N. Y.



Boxes

(7)

A new line of raintight screw cover boxes designed to protect wiring from rain, snow and sleet. They are suitable for use on junction and pull box applications for either indoor or outdoor use, and are also adaptable to special problem applications. Available in nine standard sizes, ranging from 6- by 4- by 4-in. to 18- by 12- by 6-in. Standard finish is gray baked enamel.

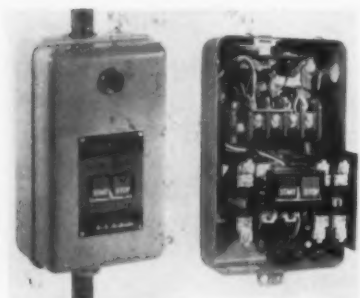
Keystone Manufacturing Co., 23328 Sherwood Rd., Warren, Mich.



Starters and Combinations (8)

A model change in explosion-proof and dust-ignition-proof Type EPC starters and combinations in 8-in. and 9-in. sizes has been announced. Model M59 is of all-aluminum construction. Mounted on a separate, replaceable frame that provides 3-point suspension, it assures effective water shedding for the entire body through the use of male body threads at the top, female threads at the bottom, and a skirted upper cover. New covers provide access to internal devices. Covers removed, the maintenance man can swing pivoted shoes to side to remove pipe framework holding starter and breaker.

Crouse-Hinds Co., Syracuse 1, N. Y.



Motor Control (9)

A new line of 0 to 4 contactors features unitized construction, making possible the benefits of building-block modification. A full range of standard, special-design and accessory control devices are available in these sizes for applications from 110 to 600 volts for fractional to 200-hp motors. Standard equipment includes molded epoxy magnet coils available in either 110/220 or

220/440-volt sizes. Conversion from one voltage to another is facilitated by a clip arrangement or by wire connections to the magnet coil terminal block. Overload relays are 100% trip-free. They can be reset manually or automatically. Building block design permits easy installation of an additional relay for three-phase overload protection as well as for a start-stop pushbutton, selector switch, auxiliary interlocks, and pilot light. NEMA Type 1, 4, 5, 7, 9 and 12 enclosures are available. New line of low-voltage motor control covers a complete range of starters and controllers that includes manual and magnetic across-the-line types, along with reduced voltage, reversing, non-reversing, combination circuit breaker and combination fusible and non-fusible devices.

Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.



Electric Baseboard (10)

A line of electric baseboards for central heating or auxiliary heating, designed so that convected heat and radiated heat assure uniform heat distribution and comfort. It is supplied with a dual-voltage heating element for use with 120 or 240-volt circuits. Four standard lengths are available—3, 4, 5 and 8 ft. Literature is available.

Brown Products Corp., 1090 Springfield Rd., Union, N. J.

Ballast (11)

A new ballast for PG, VHO and SHO fluorescent lighting in commercial and industrial applications. Designated 6G1200, the new single-case ballast for 120-volt operation of two 72- or 96-in. power groove, VHO or SHO lamps has an 18½-in. mounting dimension and eliminates need for mounting and interconnecting two separate sections. Units give reliable starting of 72-in. lamps down to minus 20 F and 96-in. lamps down to 50 F.

General Electric Co., Schenectady 5, N. Y.



Trencher (12)

A new Model M-3 Ditch Witch trencher has been announced. Features include all riveted 20,000-lb test digging chain; improved digging teeth; telescoping digging boom; spring tension adjustment for digging chain; new boom position screw; new planetary gear reduction unit. Standard equipment includes: 3-piece telescoping boom to provide selection of 2-, 3-, 4- or 5-ft boom; 3-piece digging chain for depths of 2, 3 or 4 ft; complete selection of digging teeth to cut trench 3, 4, 6 or 8 ins. wide; dual front wheels. Bulletin is available.

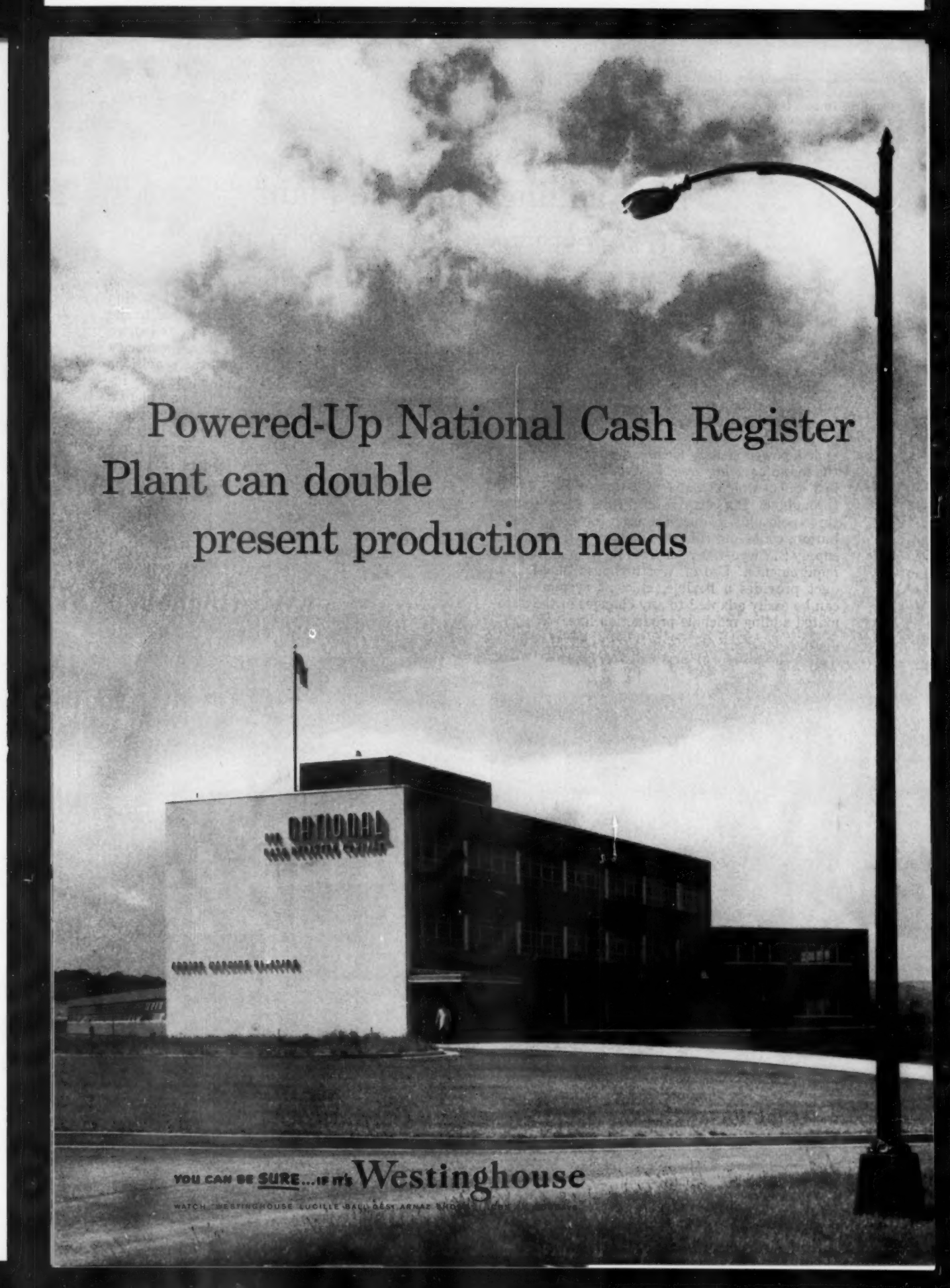
Charles Machines Works Inc., 684 B Street, Perry, Okla.



Entrance Fitting (13)

A new "snap-on" aluminum entrance head is UL approved. Three sizes carried to the job will permit an installation on 1½-, 1½- or 2-in. threaded or non-threaded, heavy or thinwall conduit. Fitting has three parts—the hub, cover and insulator. To use, slide hub down on conduit until it comes to rest on built-in, self-centering pipe stop. Except for plastic insulator, entire entrance fitting, is made of corrosion-resistant, aluminum alloy. Unit may be used in any position whether vertical or horizontal.

Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.



Powered-Up National Cash Register
Plant can double
present production needs

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH WESTINGHOUSE LUCILLE BALL BEST ARMED SHOWS LIGHT BULBS

Cover photo—Top: New National Cash Register Co. Adding Machine Division Plant, in Ithaca, New York. Westinghouse Type OV-20 outdoor lighting is used for the building approach and parking area.

New adding machine plant has 50% reserve electrical capacity

When the Ithaca, N. Y., Adding Machine Division of The National Cash Register Co. found its existing plant inadequate, a new plant site was secured. The design and planning for the new plant provided more efficient production methods and future plant expansion as required.

Once space requirements were satisfied, electrical power needs were detailed. An all-Westinghouse electrical distribution system was specified to meet these needs. A 2000/2300-kva, double-ended power center, located near the middle of the manufacturing area, feeds ten runs of plug-in bus duct which distribute low-voltage power throughout the plant. Six runs of 600-amp, three-pole plug-in duct are used for 480-v distribution, while four runs of 600-amp, four-pole duct supply 277 wye/480 v for both lighting and power requirements. Use of Westinghouse plug-in bus duct provides a flexible, efficient system which can be easily adapted to any changes in the automated adding machine production line.

The new Ithaca plant has 50% more electrical capacity than is required by present production needs. The new 146-acre site (as compared to the previous six acres) is ample for anticipated space requirements, while the electrical system capacity can be doubled simply by utilizing the provisions for expansion and the spare equipment now installed. An interesting example of the new plant's expansion possibilities is that the present plant structure can be extended 600 more feet to the back. The location of the installed power centers will allow any necessary new feeders to be installed with minimum distance and voltage drop. In some cases, present bus duct runs can be extended into the new area.

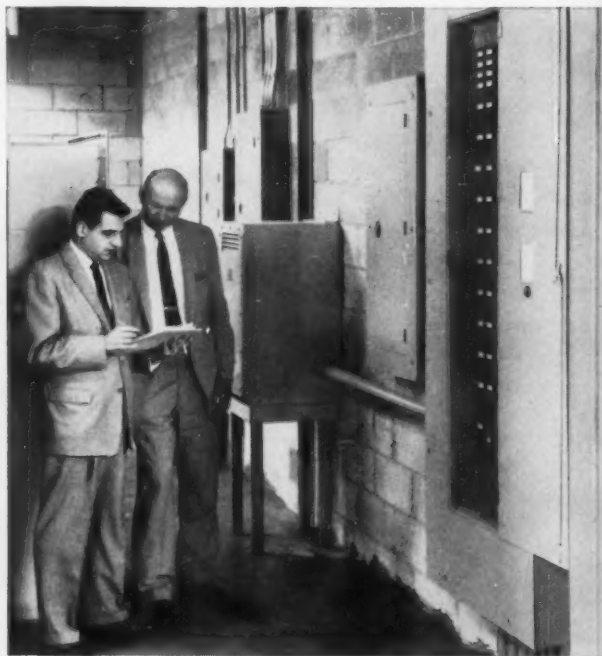
Westinghouse worked closely with the architect, consulting engineer, general contractor, electrical

(continued)

YOU CAN BE SURE...IF IT'S **Westinghouse**



Conference room discussion includes Charles T. Hansen, Westinghouse Sales Engineer; John M. Schweiger, Schweiger, Heapy & Associates, Consulting Engineers; James Miller, Westinghouse Construction Sales Engineer; Clair Dean, Buffalo Electric Co., Electrical Contractors and Westinghouse Distributor; Ed Likens, Professional Engineer, Lorenz & Williams, Architects and Engineers; and C. W. Vail, Plant Engineer, Adding Machine Division of The National Cash Register Co., Ithaca, N. Y.



J. Victor Bagnardi, Ithaca representative of Lorenz & Williams, and John M. Schweiger are shown in electrical equipment room. On wall facing them can be seen four Westinghouse panelboards and a Westinghouse 50-kva, 480-v primary to 120/240-v secondary, single-phase, DS-3, dry-type transformer. Two of the panelboards are NLAB 120/240v, one is a NHIB 277/480v, and the opened panelboard in the foreground is a CDP 277/480v.

J-94087-2

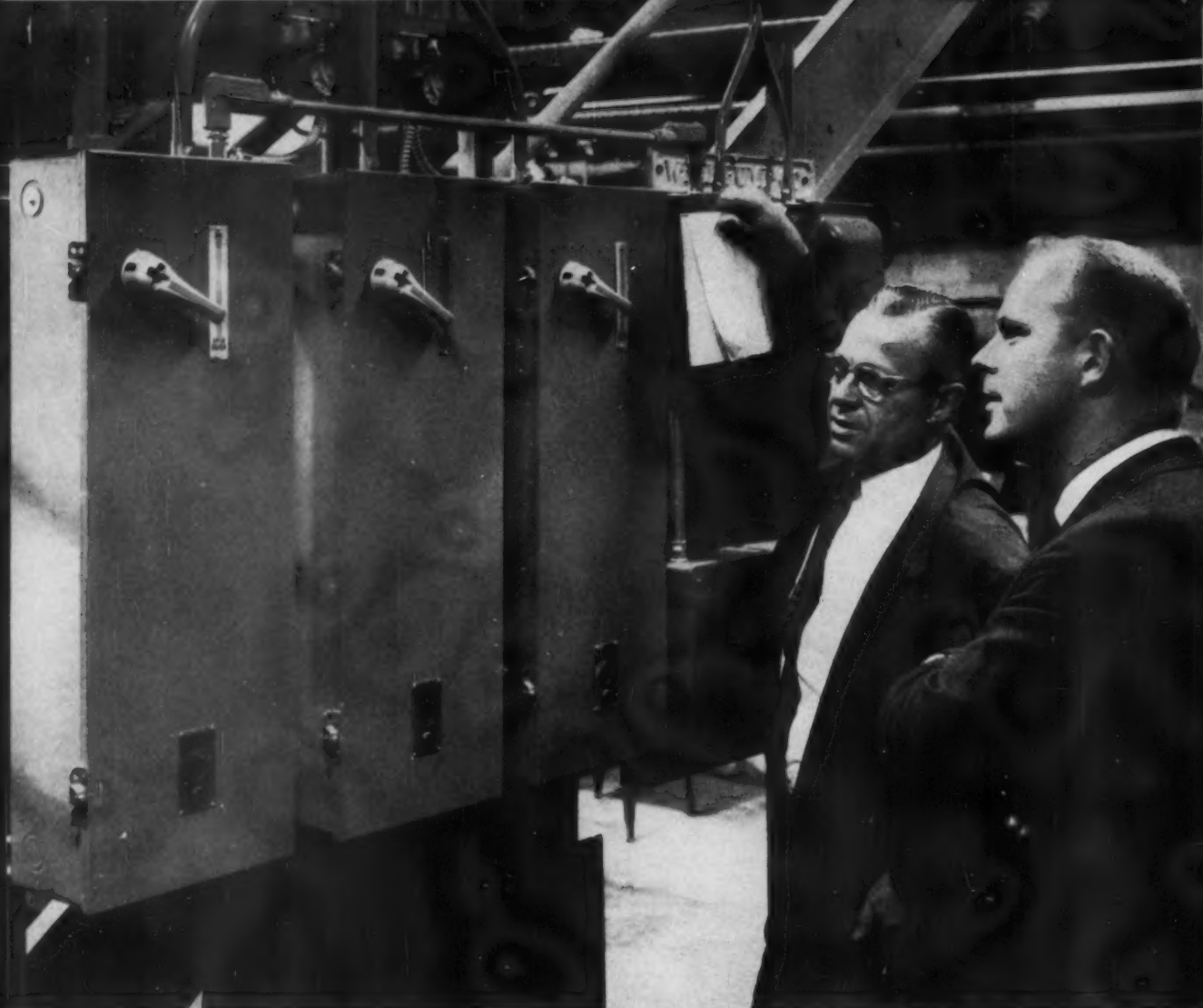


General plant view shows multiple runs of Westinghouse 2WVO-40R, 277-v fluorescent lighting and 600-amp copper plug-in bus duct. Plug-in units shown are circuit breaker type. Plug-in bus duct and circuit breaker plug-in units are standard requirements in The National Cash Register manufacturing plants.

Clair Dean, John Schweiger and C. W. Vail discuss details of Westinghouse 2000-kva, double-ended (one 1000-kva Inerteen® transformer each end) power center. Incoming voltage of 4800 is reduced to 480 wye/277. Each transformer has provision for 150 additional kva, so only fans need to be added when increased rating is needed. Four spare DB breakers are installed in board to take care of future load and, in addition, four cells are equipped to receive breakers when needed. (Note new switchgear design with three-position DB circuit breakers. Visible positioning tells at a glance if breaker is in "ON," "TEST" or "OFF" position. New "TEST" position allows testing of breaker in switchgear cell with complete safety.)



J-94087-3



50% reserve electrical capacity *(continued)*

contractor and The National Cash Register Co. engineers in selecting the equipment which provides for present and future electrical needs. Westinghouse can also help you with any of your electrical planning and construction requirements. See your Westinghouse distributor, or write: Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

J-94087-4

Owner: The National Cash Register Co., Dayton, Ohio
Architect: Lorenz & Williams, Architects and Engineers, Dayton, Ohio

Consulting Engineer: Schweiger, Heapy & Associates, Dayton, Ohio

General Contractor: Streeter Associates, Inc., Elmira, N. Y.

Electrical Contractor: Buffalo Electric Co., Inc., Buffalo, N. Y.

Westinghouse Distributor: Buffalo Electric Co., Inc., Buffalo, N. Y.

YOU CAN BE SURE...IF IT'S **Westinghouse**

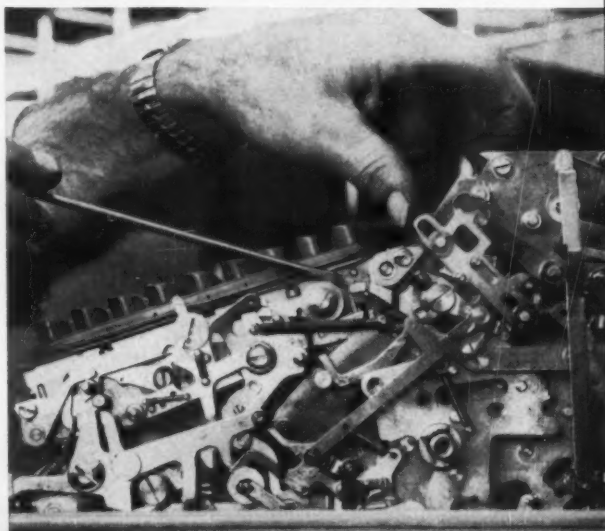
WATCH "WESTINGHOUSE LUCILLE BALL DESI ARNAZ SHOWS" CBS TV MONDAYS

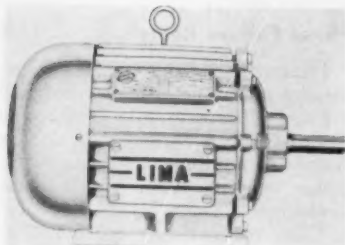
*Over 200 Pages Westinghouse Data
in Sweet's Construction File.*



Clair Dean and Charles Hansen examine three Westinghouse Class 11-204 nonreversing combination Life-Line® starters which provide control and overload protection for the motors in the equipment room.

Close-up view of adding machine mechanism as manufactured in Adding Machine Division of The National Cash Register Co.



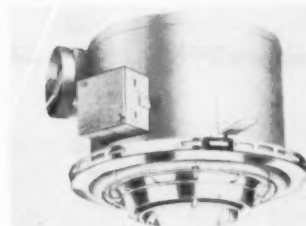


Motors

(14)

A line of new rerated NEMA Type E, totally enclosed, fan-cooled electric motors, are for use in non-explosive atmospheres containing excessive moisture or abnormal quantities of dirt, metallic dust or other abrasives. They can be furnished for standard horizontal, wall or ceiling mount. All standard commercial frequencies and voltages below 600 volts are available. Aluminum rotors have dual fans, and entire rotor assembly is dynamically balanced. Stators are impregnated with moisture-resisting, thermosetting varnish. Type E motors are available from 1 hp, 900 rpm, (Frame 213) through 40 hp, 3600 rpm (Frame 326 U).

*Lima Electric Motor Co., Inc.,
Lima, Ohio*

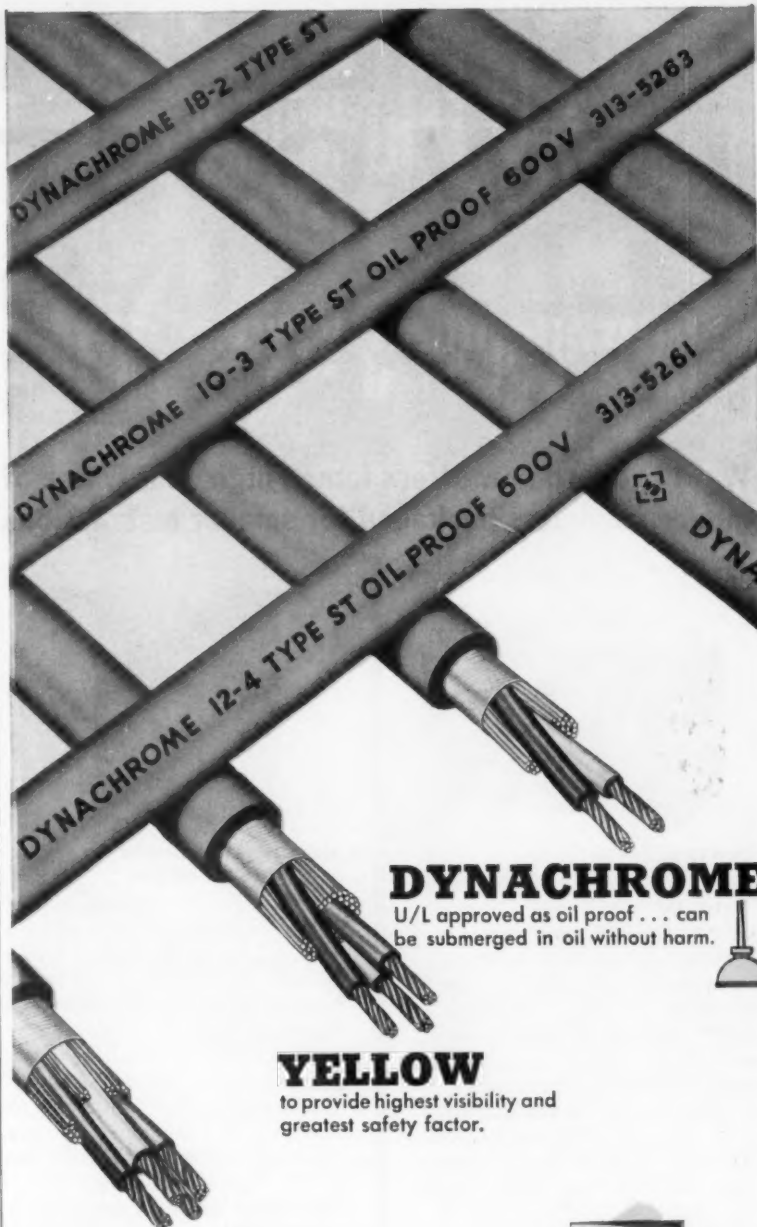


Heat-Light-Exhaust Unit

(15)

A new bathroom ceiling built-in unit called "Heetaire-Lite-Exhaust." It produces infrared radiant heat instantly. It draws air in around and under the Heetaire. Air for exhausting is pulled in through the sides of the mechanism, through the area under the reflector, and through the area around the outside of the light. Housing has a "duct transition" for use with standard 4-in. round ducting. Horizontal or vertical discharges may be used. Housing fits between standard 16-in. joist centers. Unit is available in two models, 1000 and 1500-watt, 120 or 240 volts, 50/60 ac. All ceiling Heetaires may be used with wall thermostats for automatic control.

*Markel Electric Products, Inc.
and LaSalle Products, Inc., Buffalo,
N. Y.*



DYNACHROME

U/L approved as oil proof . . . can be submerged in oil without harm.



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to provide highest visibility and greatest safety factor.

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clearly with type, size and number of conductors, as well as catalog number, all for easy identification.



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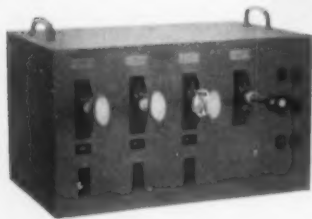
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MODERN LOW COST LIGHTING CONTROLS

Ward Leonard now offers famed high quality line of modern dimmers packaged for smaller installations



CONTROLLETTE*

Here's a miniaturized version of Ward Leonard's world famous CONTROLITE* dimmer bank.

Designed for churches, schools, restaurants, small theaters and TV studios, the modern CONTROLLETTE "package" provides smooth, accurate control of light intensity from full bright to blackout.

CONTROLLETTE is available with 3, 4, 5 and 6 individual 2.5 KW VARISTAT* lighting controls which can be interlocked for master control... or disengaged for individual control by a simple turn of the lever. This modern packaged lighting control unit is compact, portable, low in cost, and easy to install.

*Registered Trade Mark



NON-INTERLOCKING LIGHTING CONTROL

This inexpensive lighting control line is designed for reception rooms, building entrances, dining rooms, and other small areas where simple, smooth, flickerless control is all that is required.

These non-interlocking units feature highly efficient, continuously adjustable VARISTAT or RADIATAT* Dimmers in four standard ratings: 1.2, 2.5, 6.6 and 8 KW. They are designed for incandescent or (with accessories) fluorescent lamp control. Open assemblies or metal enclosures. Hand wheel or slot-closing lever operation. Multiple assemblies up to three units.

6.29

For complete facts request: CONTROLLETTE Bulletin 76 P; Non-Interlocking circular 76N from Ward Leonard Electric Co., 28 South Street, Mount Vernon, N. Y.

WARD LEONARD ELECTRIC CO.
MOUNT VERNON, NEW YORK

Result-Engineered Controls Since 1892

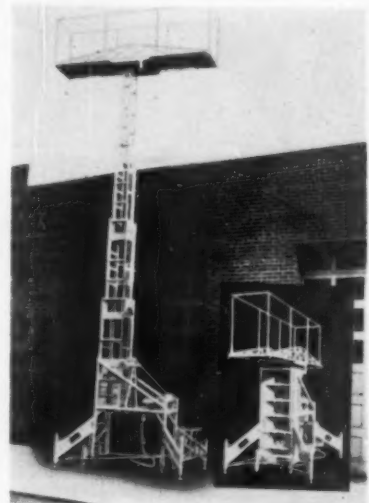
RESISTORS • RHEOSTATS • RELAYS • CONTROL DEVICES



Phase Failure Relay (16)

Phase-Guard is a phase-voltage-balance monitoring device designed for use with magnetic controls to automatically prevent 3-phase motors or equipment for operating under open-phase or single-phase conditions. It can be used to protect any magnetically controlled 3-phase equipment; to protect an individual motor or a group of motors collectively when they are fed from a common contactor or magnetically latched circuit breaker. It may be used with any type of actuating control such as pushbutton stations, thermostats, pressure or float switches, or in the trip circuit of manually operated starters. Model 230A phase failure relays are designed for use on 230-volt, 60 cycle, 3-phase line. Frequency adaptable to a range of 25 to 420 cps by changing master relay coil. Master relay contacts are rated at 15 amps. All enclosures are dust-tight and have integral 3-in. conduit bushings. Unit may be mounted in any position.

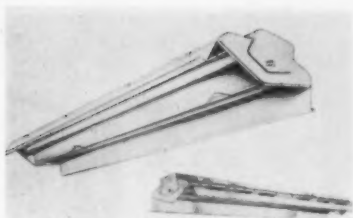
Stradley Engineering Co., P. O. Box 6006, Pittsburgh 11, Pa.



Scaffold (17)

A new all-purpose scaffold is furnished with a small platform railing for spot maintenance and a large platform and railing for area maintenance. It is a bolt-on platform with guard rails removable for storage. It is of all-welded steel construction, and is equipped with four swivel casters. It has out-riggers. Platform can be raised to any desired height.

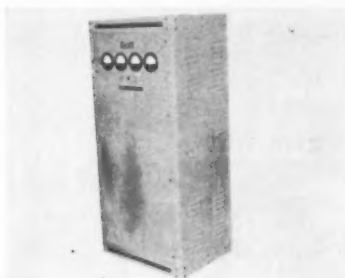
Atlas Industrial Corp., 849 39th St., Brooklyn, N. Y.



Lighting Fixture (18)

The Wyteliner industrial lighting fixtures are available with Kolorkode. Red panels are used to identify exits and fire protection equipment; green to identify general aisles, traffic lanes and other safe through-passageways; yellow for stairs, curbing, dead ends, or other dangerous areas. They can also be used to identify specific operations in the production line, and to designate or differentiate particular plant areas, storage sections, etc. Kolorkoded units feature a drop-design end plate and are for 430, 800 or 1500 ma operation. The 800 ma units use new high output lamps. The 1500 ma fixtures use VHO, SHO or Power groove lamps. Units are available in white porcelain enamel, baked-on white, or aluminum. Available with 10 or 25° uplight and with 13° or 27° shielding using T-12 lamps.

Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3, Mo.



Power Unit (19)

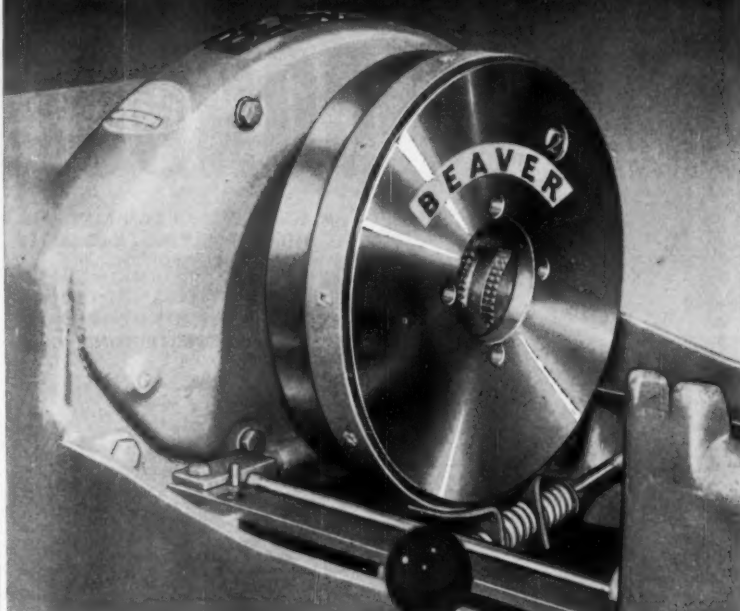
A new inverter power unit designed specifically to operate in conjunction with an Onan emergency electric plant and automatic line transfer control, but adaptable to existing standby equipment in microwave installations. Unit can take over any power load up to 5 kva within 8 to 28 milliseconds depending on what part of the ac line cycle that the interruption occurs. Power unit is a transistorized inverter, operating from a 36-volt storage battery system. It provides 1 kva of standard 115-volt, 60-cycle current.

D. W. Onan & Sons Inc., Minneapolis, Minn.

CHUCK THAT PIPE

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FOR SPEEDIER PRODUCTION



The BEAVER
Electrimatic Chuck
grips forward or reverse the
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Available on BEAVER Speed-O-Matic or Model A
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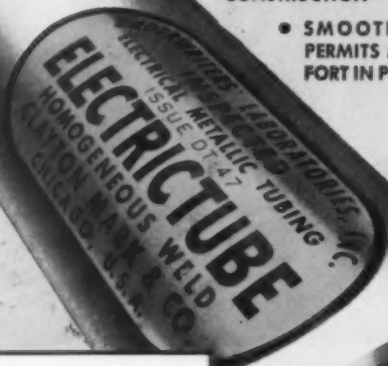


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• STEEL CONDUIT CAN TAKE PUNISHMENT DURING AND AFTER CONSTRUCTION

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ELECTRICTUBE is homogeneously electric welded and produced to exact dimensions. The pure zinc deposited into the pores of the steel on the entire exterior surface and the special mirror-like interior results in a superior thinwall conduit. Meets Federal Specification WWT-806b.

HOTKOTE rigid steel conduit meets Federal Specification WWC-581c.

GALVAKOTE rigid steel conduit meets Federal Specification WWC-581c.

ENAMELKOTE rigid steel conduit meets Federal Specification WWC-571a.

Each length contains Underwriters' Laboratories label and meets NEMA specifications.

CLAYTON MARK & COMPANY

1900 Dempster Avenue • Evanston, Illinois

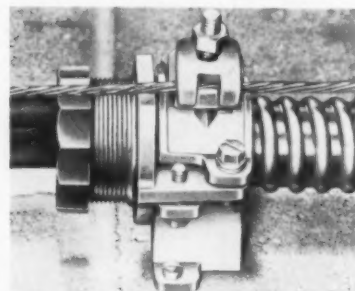


Lighting Unit

(20)

A new ceiling-mounted patient room light named Astrilite, is for use in hospitals. The three-compartment, fluorescent unit provides four levels of illumination. Soft, general room light or high-level, visually-correct light for reading and close work are provided from the head-end compartment. Full, bed-length illumination is available for examination or surgical preparation while a safety night light at foot end of fixture provides nursing convenience and patient comfort. Its optical system utilizes fluorescent tubes with high-power-factor ballasts. A specially designed, Plexiglas diffuser eliminates glare. Bulletin LC110 is available.

American Sterilizer Company, Erie, Pa.



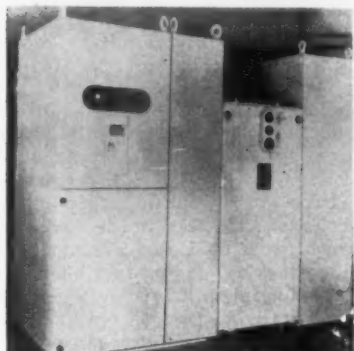
Fittings

(21)

A new line of versatile interlocked armored cable fittings, consisting of a basic connector and interchangeable accessories, can be adapted to a variety of applications on the cable. Basic connector is applicable to most terminations. Designed with twin, independently bolted saddles and a double armor stop, the connector can accommodate a wide range of cable sizes. The saddles automatically center the cable in the connector for a stronger connection. Addition of a neoprene bushing, a retainer ring and a gland nut to the basic connector makes it watertight. The

accessories—ground fitting, support clamp, and mounting bracket are used to install external ground connectors and jumpers around enclosures. Fittings will accommodate cable size range of OD $\frac{1}{2}$ in. to a maximum OD 4 ins. They are available in malleable iron or aluminum.

Thomas & Betts Co., 36 Butler St., Elizabeth, N. J.



Transformers

(22)

The Modupac line of compact indoor substation transformers has been extended to cover 112.5- and 150-kva ratings. These self-contained liquid power centers will continue to be made in the 225- and 300-kva sizes. Modular components are interchangeable between units. In all four ratings, the transformer tank is braced for full vacuum, yet size of each unit is small enough to pass through industrial doorways.

Westinghouse Electric Corp., P.O. Box 2099, Pittsburgh 30, Pa.

Electronic Air Cleaner

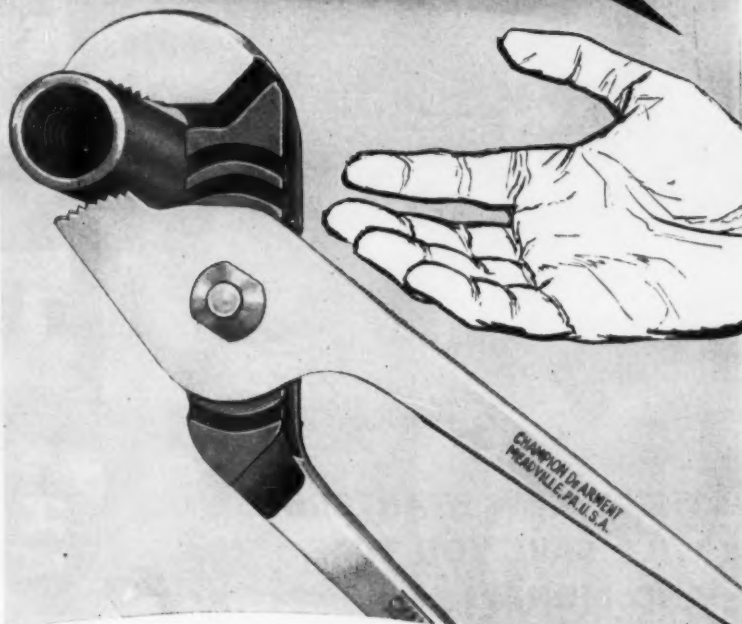
(23)

An electronic air cleaner, called the Trion DFL, can, in most cases, be installed in the same area presently occupied by standard disposable filter. It is 2 ins. deep in the direction of air flow. Advantages are—it removes airborne dirt, dust, smoke, pollen and germs from air. Unit's power requirement is that of a 25-watt light bulb. It is equipped with a gauge that indicates when dirt collecting pad should be changed. Power pack is equipped with a 6-ft power cable to permit remote control operation of unit. It is of aluminum and plastic construction. Trion is available in a variety of sizes to fit all national make furnaces and has a capacity of 640 to 1000 cfm per panel. DFL unit is designed for use in homes and small commercial establishments.

Trion, Inc., McKees Rocks, Pa.

LOOK, MISTER!

No Hands



It's Self-Gripping

CHAN NEL LOCK

No. 410

HEAVY-DUTY PLIER

• How's this for gripping power? You won't know your own strength 'til you grab hold with this heavy-duty, self-gripping plier. The Channellock No. 410 HEAVY-DUTY is actually a combination plier-wrench . . . and it will get into tight places you can't reach with a pipe wrench. A mighty handy, multi-purpose tool with four jaw adjustments up to 1-1/8".

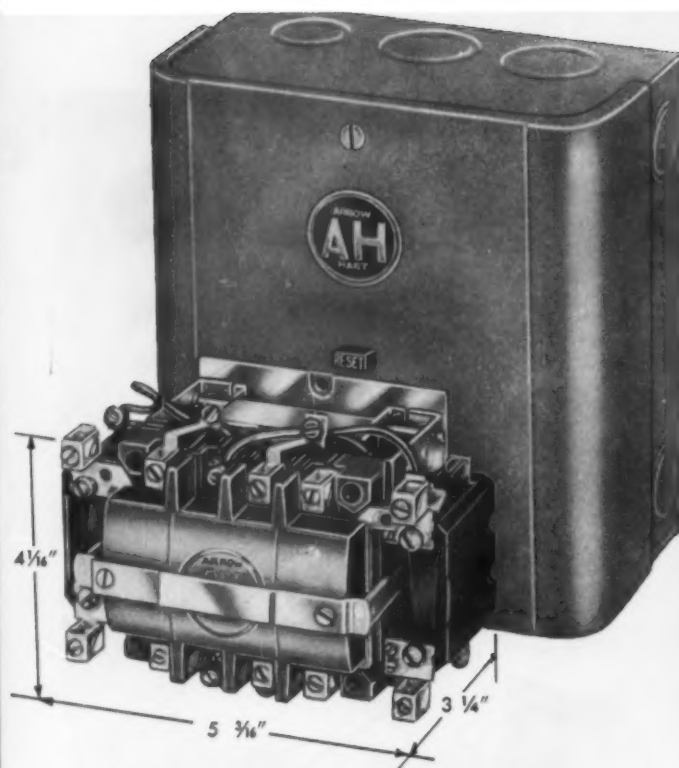
ASK YOUR TOOL SUPPLIER FOR A CHANNELLOCK No. 410 HEAVY-DUTY PLIER

BE SURE IT'S
A GENUINE
CHANNELLOCK



LOOK FOR THE
TRADEMARK
ON THE HANDLE

CHAMPION DEARMENT TOOL COMPANY • MEADVILLE, PENNSYLVANIA



THESE NEW STARTERS WILL SAVE YOU TIME AND MONEY!

HERE'S HOW:

- **NEW WIDE VOLTAGE RANGE COILS . . .** available for Sizes 0, 1 and 2. Now 1 coil replaces 3 conventional coils, *saves you money.* **STANDARD COIL VOLTAGES:** 110-120, 208-230, 440-480, 550-600 VAC, at 60 cycles. New molded epoxy resin construction gives far better protection against shock, vibration, humidity, oil, moisture, fungus and other severe environmental conditions.
- **NEW WRAP-AROUND ENCLOSURES . . .** for Size 1 give maximum accessibility. Make starters easier to install, wire, inspect and maintain.
- **STRAIGHT-THRU FRONT WIRING . . .** and easy front accessibility of contacts makes your job faster, easier.
- **50% SAVINGS IN SPACE AND WEIGHT . . .** make "RA" Starters easy to locate and install. More space for wiring and for other components.
- **A COMPLETE LINE . . .** of "RA" Starters, including Sizes 0 through 5, provides the right controls for all your jobs.

Write today for your free copy of Catalog 14: Arrow-Hart & Hegeman Electric Co., Dept. ECM, 103 Hawthorn St., Hartford 6, Conn.

Have you seen the new Arrow-Hart 100 Amp Add-On Entrance Equipment?

ARROW AH HART
Quality since 1890

MOTOR CONTROLS • ENCLOSED SWITCHES
APPLIANCE SWITCHES • WIRING DEVICES

ARROW AH HART

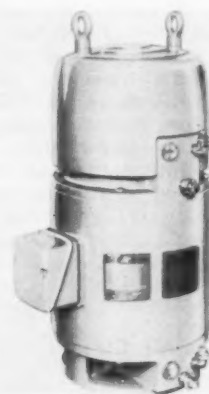


Junction Box

(24)

These all-purpose explosion-proof junction boxes, Series GRSS, have been approved for Class I, Group C & D; Class II, Group E, F and G. They can be supplied with as many as 13 conduit hubs in sizes $\frac{1}{2}$ through 1 in. Boxes are made of non-sparking, non-rusting and non-corroding aluminum alloy. They are also available for concrete mounting. UL and CSA approved.

Killark Electric Mfg. Co., Vandeventer and Easton, St. Louis 13, Mo.



Motors

(25)

All-weather vertical hollow shaft motors in ratings of 1 to 30 hp provide indoor and unprotected outdoor service on shallow or deep-well turbine pump applications for irrigation, petroleum product handling, chemical pumping, power plant condenser cooling and other industrial installations. Motor construction makes possible in-the-field assembly or removal of coupling and thrust bearing in five minutes. For bearing protection motor has an oil-metering system, sealed bearing chambers and Alnico magnet drain plugs that collect foreign ferrous particles in the oil. Self-release couplings prevent unscrewing of shafting in case of accidental motor reversal. Bulletin No. 2500

is available. These motors are also available in ratings up to 2000 hp and in enclosed or explosion-proof enclosures.

Louis Allis Co., Milwaukee 1, Wis.



Transformer (26)

A new dry-type distribution transformer in both single and 3-phase through 500 kva units. Major steps in core construction process include winding cold rolled silicon core steel, precut in 12 mil strips, on special steel mandrels. Transformers can be mounted directly to supporting structures on surfaces—and directly connected with rigid conduit—with freedom. Literature is available.

Hill Transformer Co., Inc., 1030 Washington St., San Carlos, Calif.

Capacitors (27)

New 100-kvar capacitor units, based upon new design concept, are rated 2400 to 7960 volts. Cooling ducts in the tank sidewalls and ends are indicative of new concept of dielectric circulation. Dimensionally, the 100-kvar unit is only 1½ ins. taller than the 50-kvar unit; at 9½ ins. it is less than twice as wide. Like the 50-kvar unit, the 100-kvar unit has the same standard mounting dimension of 15½ ins. and the same vertical dimension of 16 ins. from mounting bracket to bushing terminal. They are impregnated with low-temperature "Elemex" suitable for operation from minus 40°C to plus 46°C. If new mounting holes are drilled, these units can be installed in existing 50-kvar racks or blocks. Hangers, rack frames, and block frames fabricated of aluminum have been designed for the 100-kvar units.

Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.

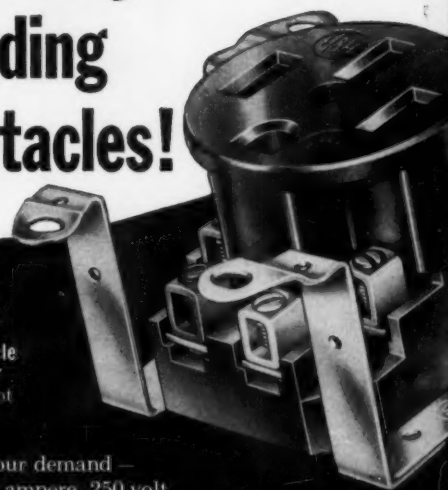
ARROW HART

YOU
ASKED for
these

Heavy-Duty Grounding Receptacles!

No. 5714 Cord Set
for use with 50A,
250V receptacles

No. 5754 Receptacle
4-wire, 50A, 250V
with U-shaped slot



Developed at your demand—these 30 and 50 ampere, 250 volt grounding receptacles are of sturdy bakelite construction. For heavy-duty applications primarily, these receptacles are U-slot grounded for protection of equipment and operator. *Tough, safe* and of dependable H & H Specification grade *quality*, they are right for—

PLANT USE . . . with electric portable tools and welding and maintenance equipment

OFFICE USE . . . with all types of office machines

HOME USE . . . with ranges, dryers, freezers and other heavy-duty appliances.

Brass or Stainless Steel plates are available.



No. 5737 Receptacle

4-wire, 30A 250V with U-shaped slot and galvanized cover. (Both No. 5737 and its 50A counterpart, No. 5738 fit 4-11 16" square box not less than 2-1 8" deep.) Listed as standard by Underwriters' Laboratories.

No. 5715 Cord Set

Both No. 5714 and No. 5715 4-wire rubber cord sets for use with 30A and 50A 250V receptacles. Available in 3', 4' and 6' lengths.

Write for more detailed information on these and other Grounding Receptacles in the complete Arrow-Hart line.

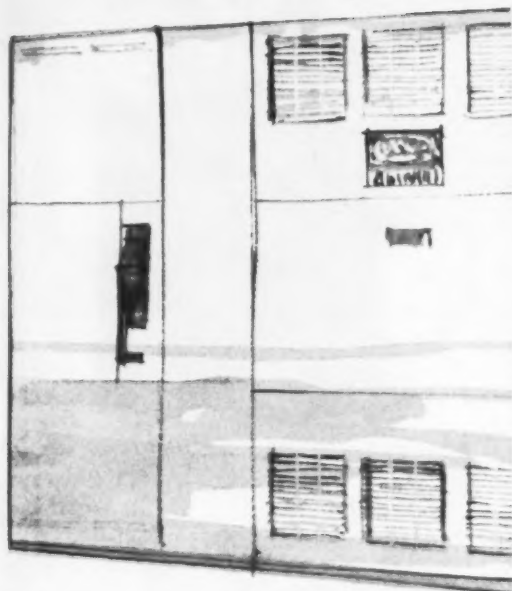
Dept. ECM

The Arrow-Hart & Hegeman Electric Co.
103 Hawthorn St., Hartford 6, Conn.

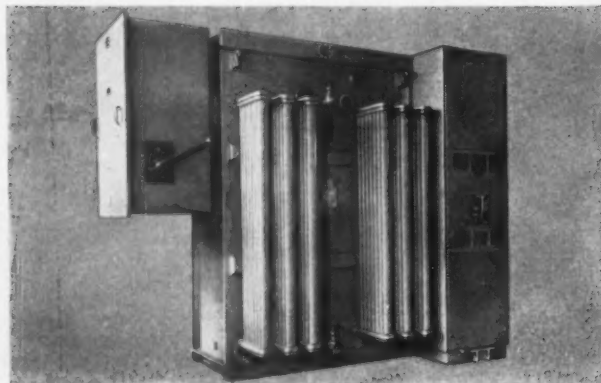




I-T-E CIRCUIT BREAKER COMPANY



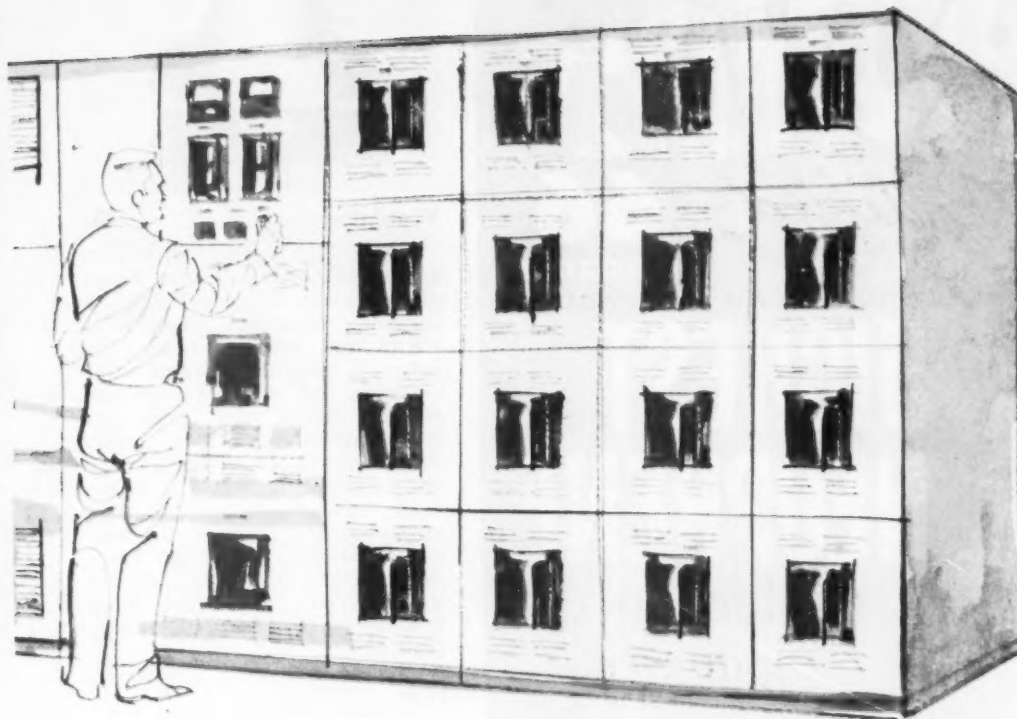
ONE ROOF



Self-contained substation. I-T-E TRANFO-UNIT combines primary disconnect, transformer and secondary circuit breaker . . . all in one package. Delivered complete. No complicated assembly of separate parts. Easy to install. No fence needed. Ideal for limited floor space applications. Use for power entrance or spot near loads. Range 45 to 3000 kva.



Individually enclosed molded case circuit breakers. Biggest choice of sizes and types you can find. Enclosures available in wide selection for indoor and outdoor use. All meet NEMA standards. Protect circuit breakers. Provide complete safety for personnel. Exclusive door designs are side hinged and slamproof. Pin type hinges.

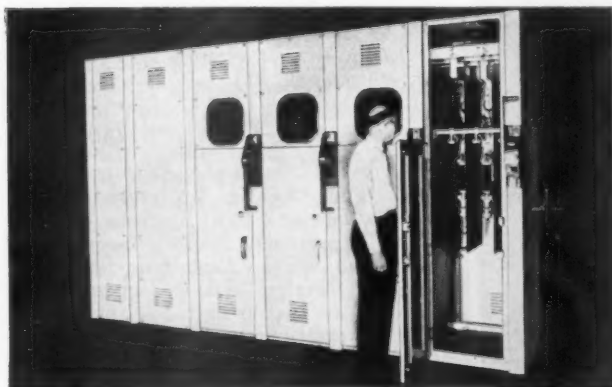


Under one roof at I-T-E, complete secondary unit substations are designed, fabricated and constructed. Transformer engineers work within walking and talking distance of switchgear engineers. They coordinate designs . . . keep tabs on manufacturing . . . to make sure that all parts fit and work properly together. Then the complete substation arrives as a unit, on schedule.

This is an important reason for the consistent superiority of I-T-E substations. Besides insuring better performance, they can save you significant trouble and

expense. I-T-E does all the coordinating of various substation components . . . guarantees sound engineering. You deal with a single source of supply. So you have less paperwork. And you can be more certain that prompt delivery will prevent delays.

Only I-T-E, of all substation suppliers, offers this single-plant source of supply. It's one of the typical advantages you get in I-T-E electrical equipment that mean greater value. Yet you pay no more. Wouldn't you appreciate better value when you buy?



Economical primary switching. I-T-E Power Switching Centers save cost and time. Give dependable fused protection at low initial investment. Building block design speeds delivery. Preassembled units easy to install. Performance-proved I-T-E switches close safely into fault. Available for remote or automatic control. Up to 14.4 kv and 1200 amp.

I-T-E Circuit Breaker Company
1900 Hamilton St., Philadelphia 30, Pa.

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| <input type="checkbox"/> Enclosed molded case circuit breakers | <input type="checkbox"/> CORDON® circuit breakers |
| <input type="checkbox"/> Power switching centers | <input type="checkbox"/> K-LINE circuit breakers |
| <input type="checkbox"/> Other _____ | |

Name _____ Title _____

Company _____

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Get complete, up-to-date information on I-T-E equipment.

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NEOPRENE

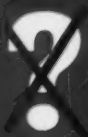
PORTABLE ELECTRICAL CORD AND CABLE

has the

HIGHEST NEOPRENE

content in the industry

The protecting outer jacket on Bronco 66 Certified contains 67.32% Neoprene—highest in the industry! This is why your Bronco 66 cables last longer, have greater resistance to oil, ozone, sunlight, heat, flame, chemicals, and abrasion.



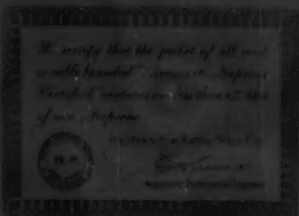
**BRONCO TAKES
THE GUESSWORK
OUT OF CABLE
BUYING**

How do you know your type 30 cord or type W. G. & Control cable is the best that can be had?

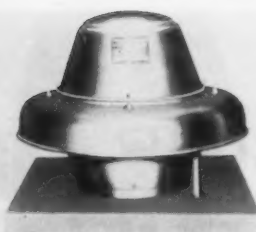
Look For These Two Symbols of Certainty:

1. Branding—“Bronco 66 Certified—67.32% Neoprene” is molded into the jacket at two-foot intervals.
2. Each carton and reel carries a registered certification as to jacket contents signed by a professional engineer. When you find these guideposts, then you will know that you have the best.

*U.S. PATENT #2867001



WESTERN INSULATED WIRE CO.

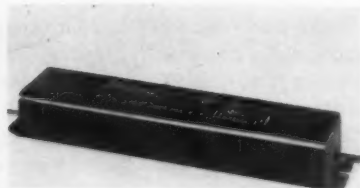


Ventilators

(28)

A new line of direct drive aluminum spun roof ventilators. Wheel diameters run from 7½ ins. to 15 ins.—cfm capacities range from 138 to 2950. They are dynamically balanced, both before and after assembly. All standard units are directly driven with permanent split-capacitor-type motors. Motor, wound for 115-volt, 60-cycle, single phase current, is located in a separate compartment and is completely out of air stream. Bearings are permanently sealed and lubricated for life. Operating parts are suspended on rubber mounts. Hood is easily removed for motor inspection.

Peerless Electric Co., Warren, Ohio



Ballast

(29)

A new cool-operating ballast for two F96T12 or two F72T12 slimline lamps. Ballast is both UL-listed and CBM-certified. Cooler operating characteristics contribute to full life of ballast.

Sola Electric Co., 4633 W. 16th St., Chicago 50, Ill.

Intercom System

(30)

A complete line of phones, named Fanon Fone 85 Series, for intercom installations of 2 to 11 stations in homes, apartment houses, farms and small offices. Each unit has selective ringing and a common talking line that permits one private conversation at a time. System can be used for conference calls as well. Some of the units available in this series are Model 8510, featuring 10 buzzer buttons, for selective ringing, as a master for an 11-station system; Model 8506, master for 7 stations; Model 8503 for 4 stations; and a single button sta-

tion phone, Model 8501. They may be wall mounted or used on desks. All phones can be connected to one or more paging amplifiers in the system.

Fanon Electric Company, Inc., 98 Berriman St., Brooklyn, N. Y.



Lighting Control (31)

A photoelectric control for outdoor lighting which operates 240-volt systems at 7 amps and handles up to 1500 watts load. Control consists of two components, a light-sensitive cadmium sulphate photo cell and a single-throw integrating relay enclosed in a transparent tenite casing for protection from dust and moisture. The control energizes and de-energizes the integrating switch to close or open circuits at predetermined light levels.

Precision Magnetic Controls, Inc., Ridgewood, N. J.

Battery Chargers (32)

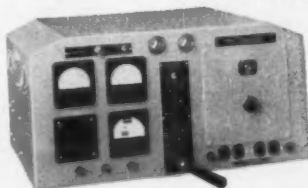
A new series of constant-voltage battery chargers with generator, motor and control panel integrated into one unit. New models utilize the diverter-pole armature design. Series-wound intermediate poles and magnetic bridges between the main shunt-wound intermediate poles and magnetic bridges between the main shunt-wound poles compensate for load changes and maintain—without external voltage regulators—constant voltage from zero to 100% load. Electrical loads beyond the safe capacity of the generator are shifted automatically to the battery. Then, when the load drops back within the normal range, the diverter-pole charger automatically reassumes the load and recharges the battery. Seven sizes of chargers are available in the new EP integral-component line, with ratings ranging from 1 through 10 kw and with rotating speeds of either 1800 or 1200 rpm. Single-phase models are for operation on 220-volt power supply, the 2- or 3-phase models for 220, 440 or 550-volt supplies.

Exide Industrial Div., Electric Storage Battery Co., Rising Sun and Adams Aves., Philadelphia 20, Pa.

UNIT CONTROLS PACKAGE SYSTEMS

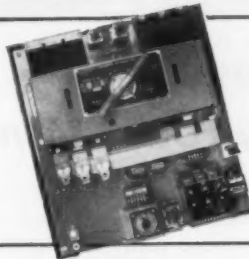
These new Lake Shore Electric developments give you the dependability and economy of simplified design...

with the ruggedness and added convenience of standard components, and NEMA-type housing when specified



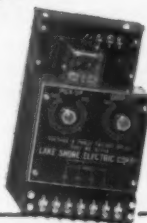
diesel generator control cabinets

Precision AC or DC controls... fully instrumented for trouble-free service. In top-mount, wall-mount, floor-mount cabs to 600 volts 50-60 cycle AC, 250 volts DC.



trans-o-matic transfer switch

This compact safety transfer switch is of mechanically-linked dual circuit breaker design which permits no neutral position. Full relay protection. To 4000 amps, 600 volts.



differential voltage sensing relays

Here's transistor accuracy and printed circuit ruggedness. Adjustable pick-up and drop-out between 70% and 100% of value with only two screw-type adjustments and standard plug-in relay.



autostatic voltage regulator

This rugged transistor design voltage regulator contains no moving parts to cause trouble. Highly accurate and low-cost. Fully warranted for one year. For single generator or parallel service.

where continuous light and power are vital... specify

THE

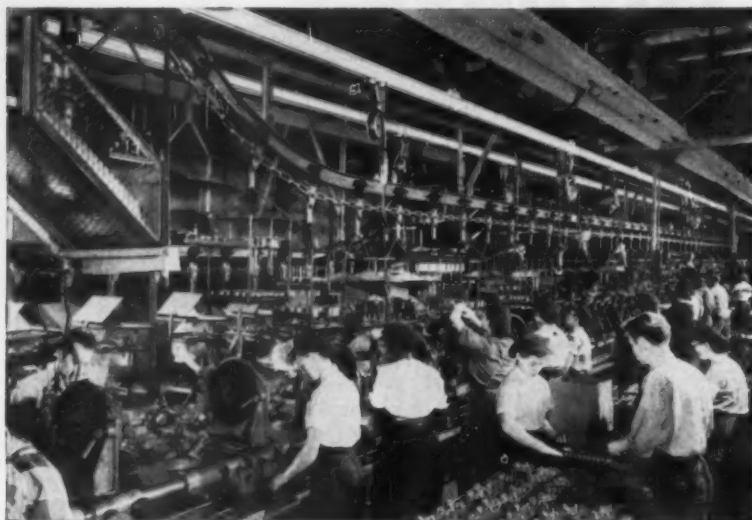


ELECTRIC CORPORATION

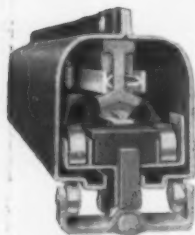
207 WILLIS STREET / BEDFORD, OHIO

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**...because it moves
with production**



Feedrail systems (60 to 500 amperes) keep production moving throughout industry — provide convenient movable power sources for:

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Eliminate the dangerous, time-wasting "cable clutter" of old-fashioned production lines — and you've gone a long way to speeding up production.

Feedrail "moving power systems" do this by feeding power to portable tools and other electrical equipment through overhead mobile outlets.

Power is available instantly anywhere along the line. Long, dragging cables that hamper production are eliminated. Employees can move about in complete safety.

Result: faster, safer production.

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Find out what a difference Feedrail can make in your plant production. Get all the details. Write today to Dept. C-4.

SOLD BY MORE THAN 1,000 ELECTRICAL DISTRIBUTORS FROM COAST TO COAST
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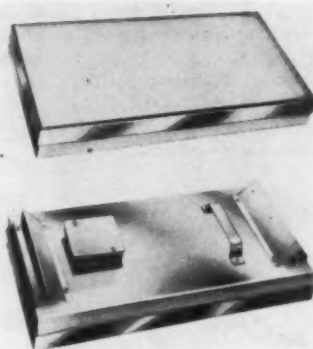


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FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.
125 BARCLAY STREET • NEW YORK 7, N. Y.

SPECIALY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES



Quartz Elements (33)

A new line of slab face quartz infrared elements for industrial processing applications. Elements are unidirectional, direct source. Elements are designed as unit building blocks for the construction of radiant surfaces to be used over conveyor belts or as the ceiling, floor and sidewalls of batch or continuous ovens. Elements may be mounted on or removed from oven assembly individually from outside the oven. Each element has quick-connecting terminals. Any size oven is possible using standard modules. Elements may be placed in any position, horizontally or vertically.

Ampere Industries, 60 Boston St., Newark 3, N. J.

Indicating Clocks (34)

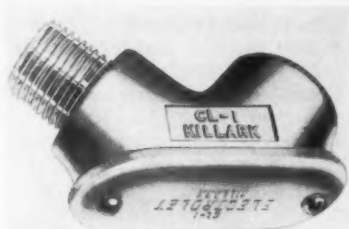
All indicating clocks for use in clock and program systems in this line have been redesigned. Clock faces have a new convex curvature glass to eliminate reflection. Case is omitted for flush mounting and dial and bezel assembly mounted as a unit. Installation is simplified since all sizes of flush clocks are designed to fit one outlet box. Boxes are equipped with a mounted receptacle and color-coded pigtail leads. They are also pre-drilled for mounting a buzzer in the box. An outlet box cover plate containing a female receptacle and pre-drilled holes for buzzer mounting is furnished with each surface clock. This is a universal plate and will fit any standard 4 by 4 in. sq or octagonal, 3 1/2-in. octagonal or 4 by 2-in. wall box. Clocks are available with a shatterproof crystal or a modern design heavy gauge wire guard and have UL approval.

Systems Division, Cincinnati Time Recorder Co., 1733 Central Ave., Cincinnati 14, Ohio.

Magnetic Motor Starter (35)

A new NEMA Size 2 magnetic motor starter, rated 25 hp at 440/600 volts, includes a special arc trap to contain and quench arcs quickly and effectively. The arc trap, similar to design used in circuit breakers, is made of a magnetic steel that attracts arcs away from the movable and stationary contact tips. Straight-through wiring and new pressure-type terminals make wiring easy. "Wedge-action" design allows the vertically-slanted contacts to move into position with less bounce. Overload relays are trip-free. An adjustable knob on top of overload relay permits easy adjustment of trip setting. Trip setting can be adjusted from 85 to 115% of nominal heater rating.

General Electric Co., Schenectady 5, N. Y.



Elbow (36)

A small, compact cast aluminum pulling elbow that is ideal for installation in areas of limited space. The elbow, listed as "CL", is available in 1/2-, 3/4- and 1-in. sizes with combinations of male and female threaded hubs. It is also available for thinwall with a "Speedolet" style hub.

Killark Electric Mfg. Co., Vandalia and Easton, St. Louis 13, Mo.

Emergency Lighting Unit (37)

Powered by the all-steel NICAD nickel cadmium battery, an improved emergency lighting unit provides instantaneous light in case of power failure. Unit is equipped with heavy-duty dual contact relays. Lighting assemblies have a built-in trickle charger to keep battery always at full charge. The double-light unit illuminates a 10,000 sq ft area for as long as two hours. Model 7 connects to a 120-volt, 60-cycle ac outlet. Lamp heads are nonglare diffused. Overall dimensions are 9 ins. wide by 18 ins. long by 22 ins. high.

NICAD Division, Gould-National Batteries, Inc., Easthampton, Mass.

the 'extra' Home Buyers look for

a better, simpler
COMPLETE HOME RADIO COMMUNICATIONS SYSTEM

Smart copper frame surrounds stainless finish panel.

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HOME RADIO INTER-COM SYSTEM

only Sound Guard offers all these features

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- Dual AM-FM tuning dials for pre-selecting stations.
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- Fast, economical installation with quick uncomplicated wiring.
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- 9 Room station capacity
- U.L. and C.S.A. approved
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DEPT. ECM-4 Philadelphia 34, Pa.

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IS CALLBACKS
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AVOID CALLBACKS
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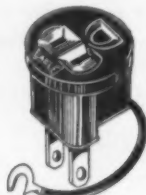
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CONTRACTORS FIND THEY
ELIMINATE CALLBACKS
SAVE TIME AND MONEY
WHEN THEY SPECIFY AND USE
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NEXT TIME, YOU, TOO,
SPECIFY THIS FABULOUS
NO. 827 PARALLEL GROUND
DUPLEX RECEPTACLE,
AND OTHER EXCELLENT
EAGLE GROUNDING DEVICES
ILLUSTRATED BELOW,
AND EXPERIENCE NEW SPEED
AND EASE OF INSTALLATIONS,
WITHOUT CALLBACKS



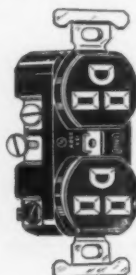
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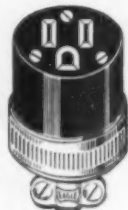
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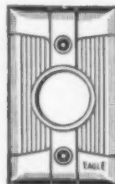
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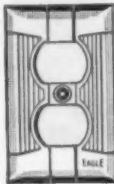
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No. 887



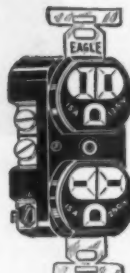
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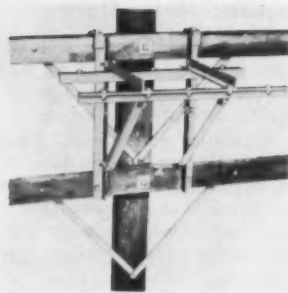
No. 829

Visit the Eagle Booth No. 139 at
the EMRA ELECTRICAL EXHIBIT,
Detroit, Michigan. May 6-7-8.

EAGLE ELECTRIC MFG. CO., INC.

LONG ISLAND CITY 1, NEW YORK

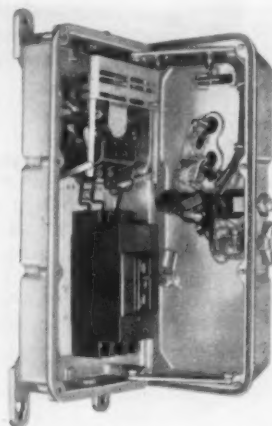
"PERFECTION IS NOT AN ACCIDENT"



Aluminum Hangers (38)

Single-unit and 3-unit aluminum hangers for 100-kvar capacitor units have been designed for the standard mounting dimension of 15½ ins. Single-unit hanger can be mounted on a pole, wall or cross-arm. The 3-unit hanger is designed for field assembly and for cross-arm mounting only. Each hanger is furnished with aluminum-coated steel bolts and a ground clamp. This clamp accommodates either aluminum or copper conductor from No. 8 solid through No. 1 stranded.

Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.



Enclosures (39)

Two new combination line starter Condulet enclosures: Type DMC (dust-ignition-proof) and Type WMC (watertight), are designed to accept and operate any of the various makes of motor starters and circuit breakers. Single speed non-reversing combinations are equipped with a universal mounting plate, motor starter rest assembly and circuit breaker operating assembly. Mounting plate is fastened to the back of the Condulet body with a large knurled and slotted bolt in the center of plate. Built-in pushbutton stations and selector switches with various contact arrangements, pilot lights, and

control transformers can be supplied. Separate mounting lugs are bolted on body. A center position is provided on back of body so that lugs can be attached for 3-point suspension or center pole, 2-point, mounting. Cover hinging arrangement allows DMC-WMC Condulets to be mounted directly adjacent to other Condulets.

Crouse-Hinds Company, Syracuse 1, N. Y.

Drills

(40)

Two new portable electric drills have been added to this line. A new $\frac{1}{2}$ -in. special drill for extra calibre drilling in machinery, rigging, construction and repair work. It drills diameters up to $\frac{1}{2}$ in. in steel, $\frac{3}{4}$ in. in masonry, 1 in. in hardwood, and drives hole saws up to 2 ins. Also an all-new $\frac{3}{4}$ in. drill for use in light automotive work, service trades, farm repair jobs, etc. Unit has a drilling capacity up to $\frac{1}{2}$ in. dia in steel and $\frac{1}{2}$ in. dia in hardwood. It is also capable of driving hole saws up to 1 $\frac{1}{2}$ in. dia in any material a hack saw will cut.

Black & Decker Mfg. Co., Towson 4, Md.



Lighting Control

(41)

A new automatic lighting control, called Skywatch, is adaptable to any street light now in operation, turns on light when needed, day or night. It responds to sky luminosity through a photo-sensitive unit which turns the street light off or on, depending on natural light conditions. If visibility is poor during the day, it turns the lights on automatically. Unit is completely shock and vibration-proof, and will operate throughout a temperature range of minus 40°C to plus 80°C. Diameter and height are 3 ins each. Operates on 110/125-volt ac, 50/60 cycles. Control switch rating: 1000 or 1800 watts of incandescent lamp load.

Wheeler-Fullerton Lighting Division, Franklin Research Corp., 275 Congress St., Boston, Mass.

Checked 'em all . . . got Far More for My Money

when I bought this terrific new

RIGID 535

Pipe & Bolt Threading Machine



Pats. Pending

Complete with
1 Universal Die Head, 2 Sets of Dies
for $\frac{1}{2}$ " to 2" pipe or conduit

Looks good, does better. Perfect cutting, reaming, threading fast . . . and easy! Three tools operate independently . . . swing up out of the way for short conduit chucking from front. Slip-proof Speed Chuck is a great performer. Concealed oil system, automatic shut-off nozzle. Quick-opening die head sets to size right in machine. Power? . . . RIGID-built motor handles 2" pipe, conduit, bolt, rod —and 12" geared tools easily. Try it, compare it . . . and you'll understand its enormous popularity! Leg and wheel stands available. At your Supply House.

Time-savings
on just 3 large
jobs more than
paid the '460"
price!



The Ridge Tool Company

Elyria, Ohio, U. S. A.

THREADED PIPE . . . It's Tight . . . It's Best . . . Costs Less!

Latrobe Electrical Products



New
No. 190
Line

TRU-LEVEL Fully Adjustable FLOOR BOX

Three screw legs and a 1½ inch threaded adjusting ring make for fast, easy leveling. A rubber collar protects the adjusting ring threads.

The No. 190 is 2½" deep with two 1½" and two ¾" KO's in sides—three 1½" and two ¾" KO's in bottom.

It is the last word in unique design, allowing considerably more work space. Permits "on-the-job" interchangeability with the various new standard styles and sizes of receptacles, except for the 30 amp. and larger of the 2 amp. series which are readily fitted at the factory.

Water and moisture proof.



Insulator Supports

Support porcelain or glass insulators to steel framework without punching holes. 4 sizes—1", 1½", 2" and 2½".

"Latrobe" Pipe or Conduit Clamp

This clamp is made of malleable iron, castings plated to prevent rust and has a safety bite of zinc hardened.



Two sizes. Two models—right angle and parallel—each in 10 sizes to handle pipe or conduit ½" thru 12".

Latrobe Products
New, Removable Plug, Rem.
Adjustable Plug, Rem.
Core, Key, Core, Plug,
Switch, Rem. Mounting,
Plug, 2, Conduit Hanger,
Insulator, Support,
Cable, Support, Flat Wire,
Bench and Cable, Clip.



Communication Unit (42)

Communication unit Model M enables point of work communication in checking and aligning facilities. Transistor-powered amplifier with a combination transmitter-speaker, four self-contained penlight batteries and switching. Switch normally in listen position with spring return from one talk position and no spring return from other. Two units and any existing conductors enables point of use communication to another location. It can be heard 20 to 30 ft and the unit at each end can monitor. Volume control for adjusting listening sound level. May be operated through carrier equipment.

Stewart Brothers, Division of
Instrument Laboratories, 335 W.
Walton Place, Chicago 10, Ill.

Wall Plates (43)

Decorator Series wall plates are designed to blend with or accent interiors of residential, commercial or industrial buildings. Series includes 18 different designs of reversible metal and clear plastic inserts and four basic frames. 1-, 2-, 3- and 4-gang, in brown or ivory plastic. Insert designs are for use with single, double and triple outlets; single switch; single, double and triple interchangeable devices; telephone bushing; telephone plug; single, double and triple remote-control switches; and a blank. Other new products include a 4-plug outlet and a pushbutton switch. Both are listed by UL.

General Electric Company, 95
Bathway St., Providence 7, R. I.

Film Illuminators (44)

New explosion-proof "EFUX" film illuminators in 2, 3 and 4 width model now make it possible to look at a sequence of film without an-

noying spacing separating the sections of film and slowing down readability. Switches may be positioned at top of viewing surface by inverting the assembly in the wall recess at time of installation. Correctly spaced chrome plated roller clips are provided to hold x-ray film. Also, extended hinge clips are furnished to support wet film holders. Each unit uses T-12 fluorescent lamp and fitted with 110/125-volt, 60-cycle ballast. All models, including single-gang "EFUX", come in two styles—shallow with 1½ in. flanged cover for walls 4 ins. thick; deep for walls 6 ins. thick or more.

Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.



Lampholder (45)

New lampholder for intermediate screw base lamps is UL and CSA approved for 75 watts, 250 volts. It has a heavy molded bakelite housing with built-in wire leads, and is available with many styles of mounting brackets. Utilizing a square shoulder as a permanent locking device, the housing and bracket are secured by a large tubular eyelet. Wire leads are available in any length and with all types of insulation such as: plastic, asbestos, rubber, etc. Solderless terminals can be applied to leads, if desired. All metal parts are plated for corrosion resistance.

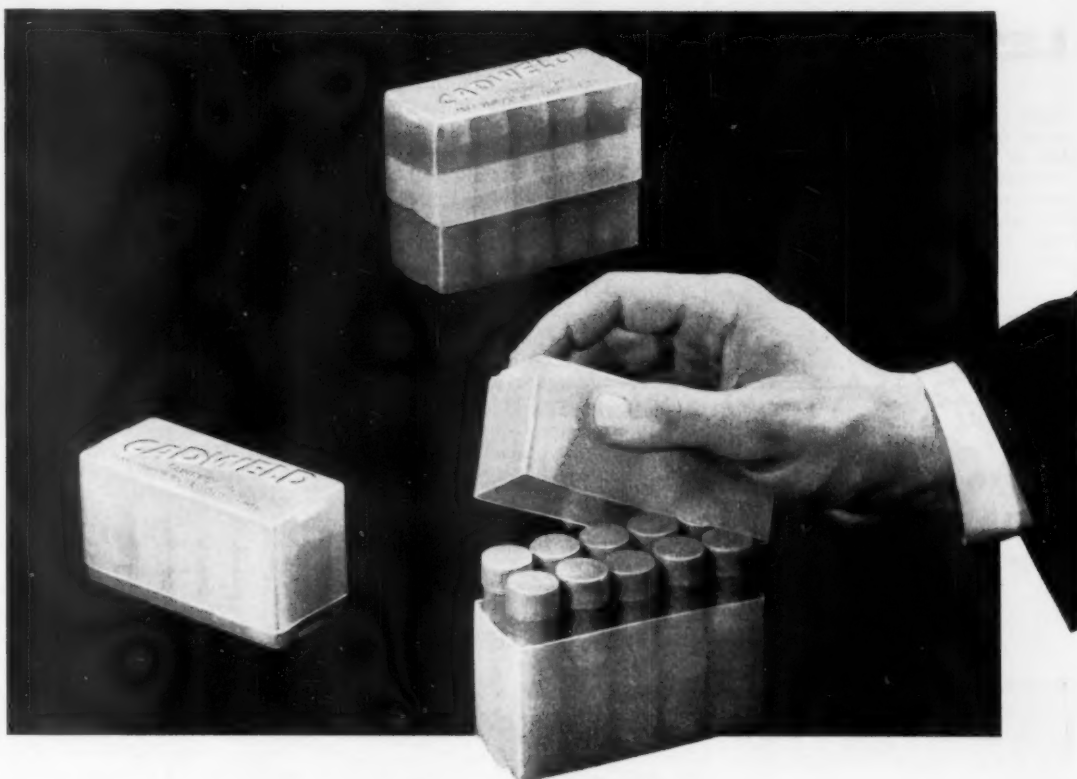
Lancraft Mfg. Co., Inc., 60
Green St., New York 12, N. Y.

Pushbutton (46)

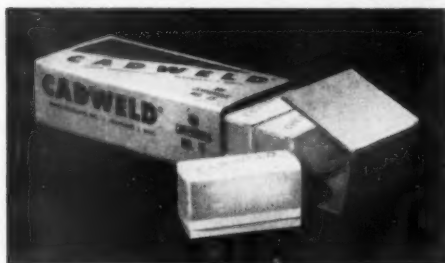
New lighted, flush, miniature electric pushbutton with self-contained bulb for ringing doorbells and chimes, are available with or without decorative plates. The lighted "Mite" pushbutton acts as a direction beacon. No. 455 is for 6 to 16-volt transformers for bells, buzzers and chimes and No. 456 for 24-volt transformers for motor-driven chimes.

Trin Manufacturing Corp., 1480
Ferry Place, Bronx, N. Y.

For You! FIRST IN A SERIES OF NEW PRODUCT SERVICES



**tape sealed polyethylene cartridge cartons
offer 3 cost saving advantages . . .**



1. Cartridges are available in smaller package quantities with no increase in cost. Job select your requirements.
2. Increased resistance to moisture insures fast positive ignition.
3. Permanent container protects inventory.

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2070 E. 61st Place • Cleveland 3, Ohio
IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

Latrobe Electrical Products



**New
No. 190
Line**

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Water and moisture proof.

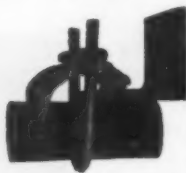


Insulator Supports

Fasten porcelain or glass insulators to steel framework without punching holes. 4 sizes—1", 1 1/2", 2" and 2 1/2".

"Latrobe" Pipe or Conduit Clamp

This clamp is made of malleable iron, cadmium plated to prevent rust and has a safety bite of case hardened



tool steel. Two models—right angle and parallel—each in 10 sizes to handle pipe or conduit 1/2" thru 4".

Latrobe Products
Non-Adjustable Floor Boxes
Adjustable Floor Boxes
Gang Boxes—Cover Plates
Junction Boxes—Nozzles
Pipe or Conduit Hangers
Insulator Supports
Cable Supports—Fish Wire
Staple and Cable Clips

**Fullman
Manufacturing Co.**

1209-1215 JEFFERSON STREET
LATROBE, PA.



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Stewart Brothers, Division of Instrument Laboratories, 315 W. Walton Place, Chicago 10, Ill.

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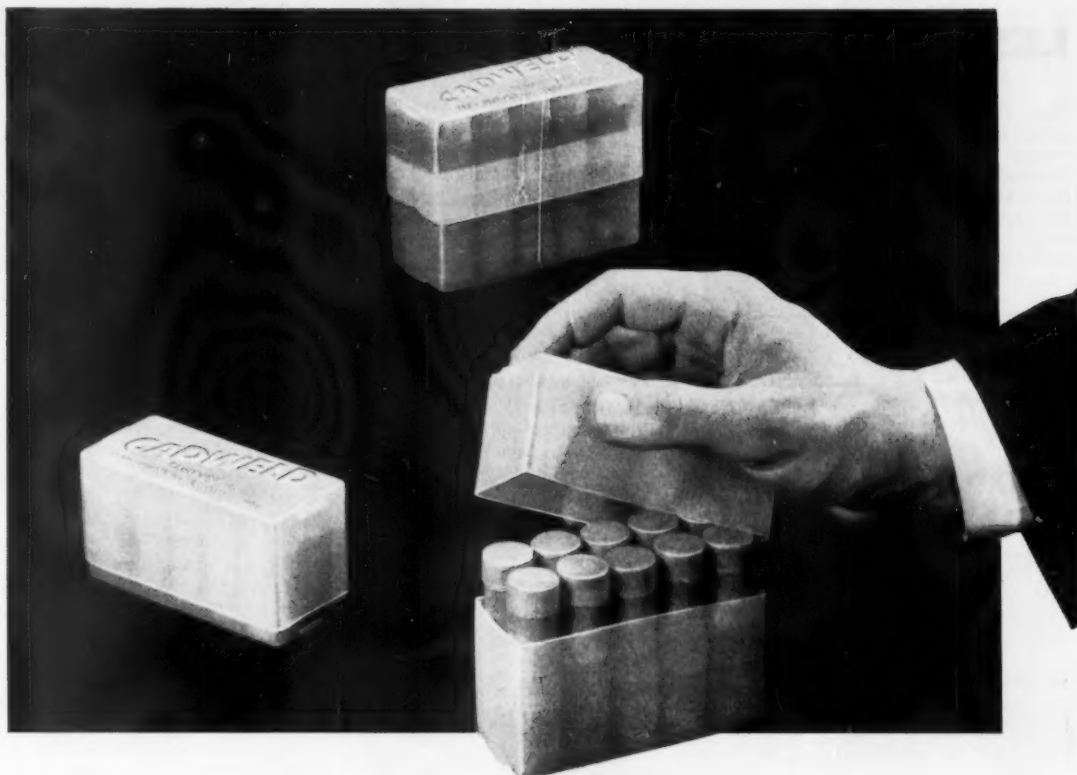
Leecraft Mfg. Co., Inc., 60 Greene St., New York 12, N. Y.

Pushbutton (46)

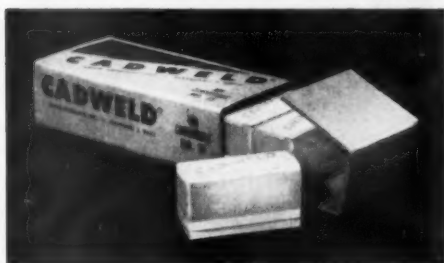
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For You! FIRST IN A SERIES OF NEW PRODUCT SERVICES



tape sealed polyethylene cartridge cartons
offer 3 cost saving advantages . . .



1. Cartridges are available in smaller package quantities with no increase in cost. Job select your requirements.
2. Increased resistance to moisture insures fast positive ignition.
3. Permanent container protects inventory.

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2070 E. 61st Place • Cleveland 3, Ohio
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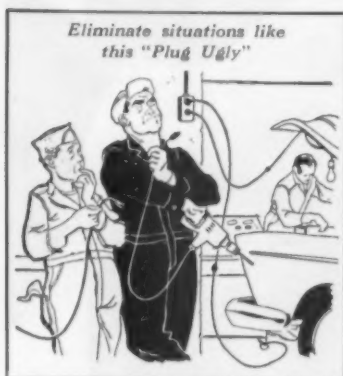
PLUGMOLD®

GIVES MORE

OUTLETS FOR

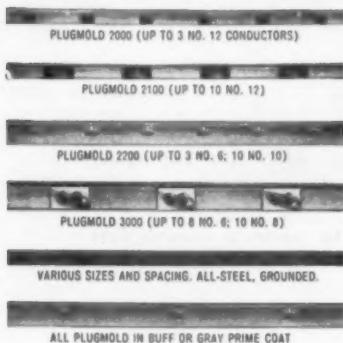
LESS MONEY

Easy installation on any surface gives lowest-cost way to provide lots of outlets wherever desirable. Planning flexibility, simplicity of later additions of circuits or outlets, also help make PLUGMOLD easy to sell. Get it from your distributor.



WIREMOLD®

THE WIREMOLD COMPANY • HARTFORD 10, CONN.



The Wiremold Company, Hartford 10, Conn. E4
Please send FREE PLUGMOLD DATA to:

Name _____

Company _____

Street _____

City _____ State _____



Gear Motor (47)

A new fhp gear motor for use in both universal and induction applications. Available in ratios from 0:1 to 60:1, unit consists of Model A-26 gear reduction unit in combination with either Model 2900 induction motor or Model 29-500 Universal motor. As a universal ac/dc or shunt motor unit has ratings of from 1/70 to 1 hp and torque output of up to 60 in. lbs. depending on ratio used. As an induction unit, it is available in 2-pole and 4-pole models from 1/70 to 1/15 hp, with same range of torque ratings. Either manual or automatic overload protection can be supplied for all applications except low-voltage dc use. Brush type motors can be supplied with single speed, two speed or adjustable speed governors.

Howard Industries, Inc., 1700 State St., Racine, Wis.



Transformers (48)

A complete line of liquid filled transformers consisting of both oil and askarel immersed types for distribution and power uses. The oil and askarel-filled units range in capacity from 10 kva up to 5000 kva, at 69,000 volts. Units will also be designed for substations to be combined with primary and secondary switchgear installations. High and low voltage bushing terminals accommodate either copper or aluminum line leads.

Precision Transformer Corp., 2218W. Lake St., Chicago 12, Ill.

Enclosure (49)

A new "lock-off" device has been incorporated in NEMA 4 and NEMA 12 enclosures for manual starters. By sliding a stainless steel plate over the "Start" button and inserting a padlock, the starter can be locked in the "Off" position. The pushbuttons are recessed to prevent accidental operation. The new industrial enclosures are designed for Square D Types B and C integral horsepower manual starters. Silicon rubber boots over the pushbuttons prevent entry of water, dust or coolant. The "Start" and "Stop-Reset" buttons are made of anodized aluminum, and are inserted in boots. Bulletin 2510 is available.

Square D Company, 4041 North Richards St., Milwaukee 12, Wis.

Drills (50)

A complete new line of trench drills which permit contractors to drill holes and lay pipe without breaking paving or disturbing the surface or disrupting traffic. Drill operates in a trench dug to the depth at which the pipe is to be laid. Drill is placed in trench with a side-boom tractor or a truck-mounted winch. The auger rotates inside the pipe and advances the pipe as the hole is drilled. Hole is drilled and pipe pushed simultaneously. Auger flights feed the drilled earth back through the pipe. Drills handle augers 4 ins. to 24 ins. in diameter and 2 ft to 6 ft in length. All drills have variable hydraulic feed installed in a rigid frame for drilling accuracy.

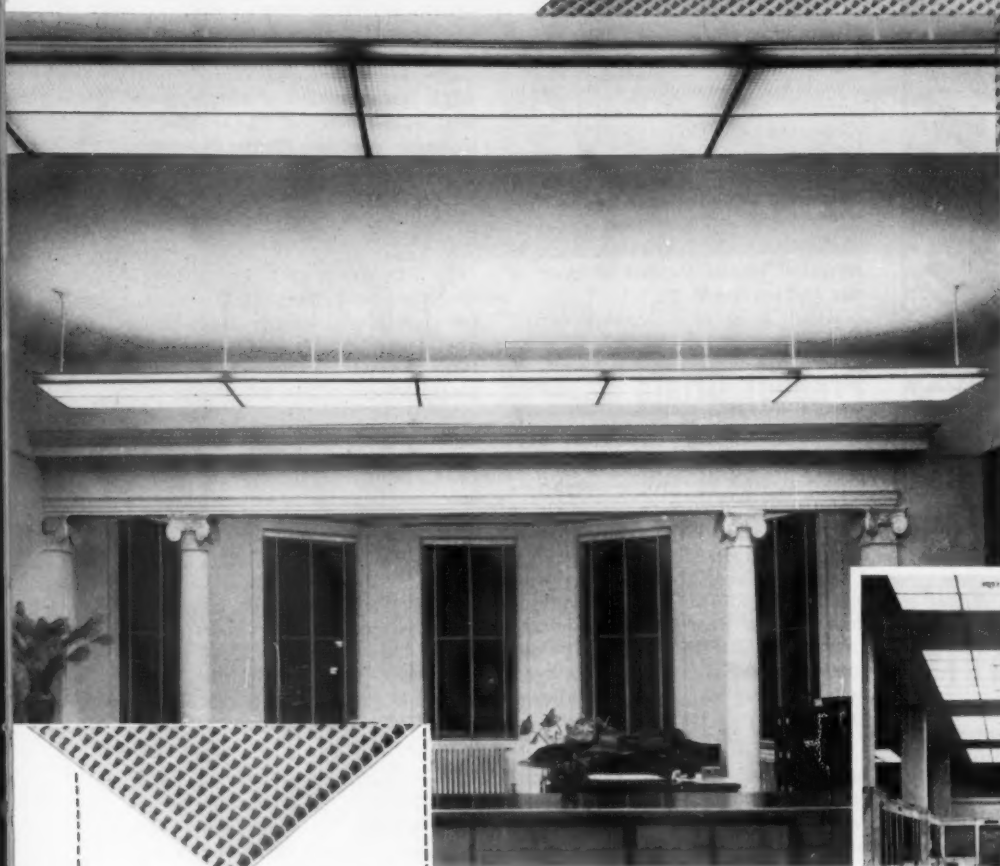
Salem Tool Company, Salem, Ohio

Outlets (51)

Designed to simplify and speed residential and industrial power installations, two new surface mounting power outlets with metal housings are announced. They are fitted with 30- or 50-amp receptacles. By snapping out receptacle, wiring can be done "in the open". Identical sizing of 30- and 50-amp receptacles makes them interchangeable. Both receptacles are of bakelite, 250-volt, 3-wire. The 30-amp has L-shaped grounding slot. Back plate slides open to make terminal connections visible and available. Combination knockouts— $\frac{3}{4}$ - and 1-in., at one end and back for non-metallic cable and 1-in. conduit.

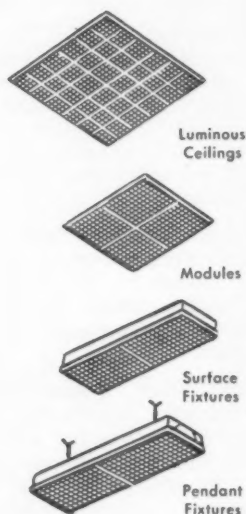
Bell Electric Co., 5737 S. Claremont Ave., Chicago 36, Ill.

LEADING FIXTURE MANUFACTURERS *use* american plastic louvers . . .



● Library Office .
Lighting by Curtis

● Gary Bank
Lighting by Sweeney Electric Co.



● American Louvers are available in white, and your choice of pastel colors.

Because the exclusive process of American Plastic Louvers provides the finest shielding media for all types of lighting equipment

American Plastic Louvers offer the maximum in conformability for any lighting plan, whether it be commercial, institutional, or industrial. They give soft—glare free, efficient inexpensive visual comfort. Maintenance free—self-aligning for individual fixtures, modular patterns or full ceiling installations.

Be sure to specify American Plastic Louvers on your next lighting job for the ultimate in lighting.

OUR ENGINEERS in your area are available to help you with your lighting problems . . . for additional information, write for detailed bulletin.

american louver company

BOSS . . . COMPLETE LINE OF ELECTRICAL ENCLOSURES



SAVE UP TO 35% WITH

TELEC-CON PLASTIC CONDUIT

... a most versatile, dependable and economical conduit for electrical and communication lines, single or multiple duct installations, underground or underwater!

YOU CAN SAVE UP TO 35% on installation costs, and eliminate most maintenance problems, with lightweight, water-tight and corrosion resistant TELECON, available in four types, 2" to 6" diameters.

Send for complete brochure, and name of your nearest supply point.



Switchgear

(52)

Extension of 600-volt low-voltage metal-enclosed switchgear line to accommodate the complete range of secondary unit substations for 480-volt service has been announced. Featuring "closed door" disconnecting and drawout LA-75A low voltage power circuit breakers, the switchgear has a spring-held dust seal mounted on the inside of the door which fits around the breaker cover in the connected test and disconnected positions. Switchgear's breaker compartments form a stacked, bolted front section to which is added the rear section. All control wiring from the secondary control fingers is brought to terminal blocks located at rear of bus compartment.

Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.

Product Briefs

(53) Spring City Electrical Mfg. Co., Spring City, Pa., has introduced a line of bronze bushings to join ground wire to conduit, for use with metallic protected cables and other grounding applications. Units are available also in aluminum. . . . (54) A safety device designed to protect crane booms from contact with overhead power lines, called Saf-T-Boom, has been developed by Saf-T-Boom Sales & Service Corp., Dallas, Texas.

(55) Two improved 600-volt butyl-molded current transformers with significantly increased cable capacity, color-coded nameplates for ready identification of current ratings and a new, versatile mounting arrangement have been announced by the General Electric Company, Schenectady, N. Y. . . . (56) Kohler Co., Kohler, Wis., has announced another in its series of new, bigger capacity electric plants. Model 75R81—a 75 kw, 120/208-volt ac electric plant equipped for remote starting.

(57) New transistorized photoelectric control has been announced by Autotron, Inc., Danville, Ill. . . . (58) General Electric Co., Schenectady, N. Y., has announced that six models in its line of round, die cast, aluminum meter sockets have been tested and approved by UL.

(59) Line Material Industries, McGraw-Edison Co., has announced new and improved pin-type insulators in two sizes corresponding to NEMA classes 55-4 and 55-5.

Catalogs & Bulletins

(60) ELECTRIC GENERATORS. 4-page folder describes 3 types: ac models from 1.5 to 10 kw, battery-charging models from 1.5 to 5 kw, and tractor-driven models of 4, 7 and 12 kw. D. W. Onan & Sons Inc.

(61) PRIMARY DISTRIBUTION overhead system (5 to 15 kv). 20-page bulletin details Plexiglas spacer unit, adapters, phase conductors and messenger cable, with tables and illustrations on installation. Rome Cable.

(62) FLUORESCENT FIXTURES using U-shaped hot-cathode slimline lamps for luminous ceiling applications are described in 4-page bulletin. Plug-in type ballasts are housed in center beam section, which also acts as support for lamps. Transolite Corp.

(63) ELECTRICAL TAPES. 4-page brochure is guide to upper temperature limits; graphs show relative life of various backings. Minnesota Mining and Mfg. Co.

(64) TOGGLE BOLTS. Bulletin 7001 describes and illustrates line of toggle bolts with specifications on diameters, lengths, weights, catalog numbers and packaging information. Diamond Expansion Bolt Co.

(65) SYNCHRONOUS GENERATORS. GEA-6815, 4 pages, describes high-speed generators used in airports, construction projects, factories, and other applications requiring ac power source. General Electric Co.

(66) DIMMING BALLAST for use with Luxtrol dimming controls. New ballast permits smooth, flickerless control over a range of maximum-to-minimum illumination in a ratio of 500 to 1 using 40-watt rapid-start fluorescent lamps. Superior Electric Co.

(67) TWO-SPEED SAW with reciprocating motion. Recipro Saw, useful for fast wall cut-outs for switch and fuse boxes or for cutting conduit or cable, is described in 4-page bulletin. Skill Corp.

(68) TRENCH DRILLS. 6-page bulletin gives operating specifications, dimensions, and recommended uses for three models handling augers up to 6 ft long and 24 ins. in diameter for boring holes beneath paving and pushing pipe. Salem Tool Co.

BOSS ... COMPLETE LINE OF ELECTRICAL ENCLOSURES

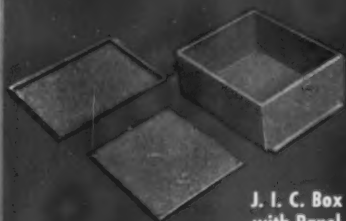
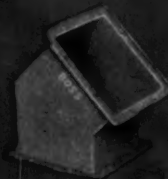


BOSS J.I.C. Wireway and Fittings

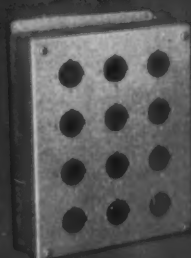
Flanged Hinged Cover Wireway & Fittings

Flangeless Screw Cover Wireway & Fittings

Flangeless Hinged Cover Lay-In Wireway & Fittings



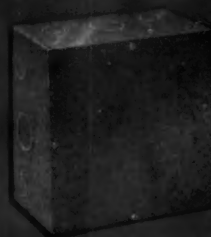
J. I. C. Box
with Panel



Oil Tight
Pushbutton Enclosure



Type "A" Box



Screw Cover Pull Box

"The Line of Least Resistance"

BOSS

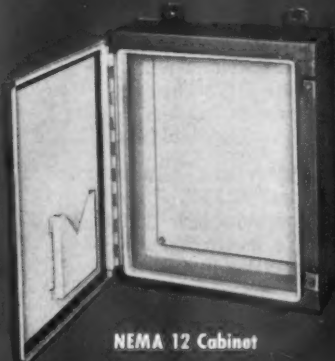
You can always be sure of excellent quality and prompt delivery on stock or "specials" with the complete line of BOSS Boxes, Wireway and Fittings.

Job-engineered for quick, easy installations, BOSS enclosures are code gauge steel, have smooth corners, with firm but easy knockouts. All units are *UL* approved. Finished in durable gray baked enamel.

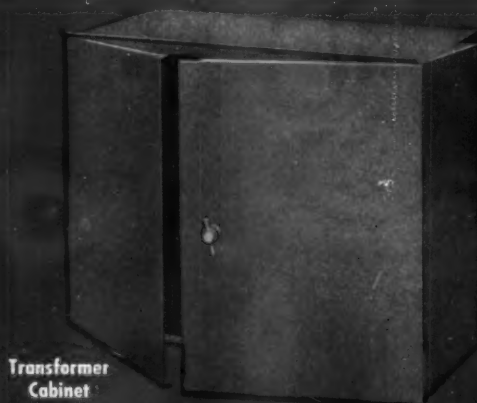
BOSS now also offers you new *Oil Tight* Push Button Enclosures for excellent protection against oil, dirt and liquids.

Write for Catalog on the complete line of BOSS Electrical Enclosures.

Sold thru leading distributors everywhere.



NEMA 12 Cabinet



Transformer
Cabinet



Telephone Cabinet

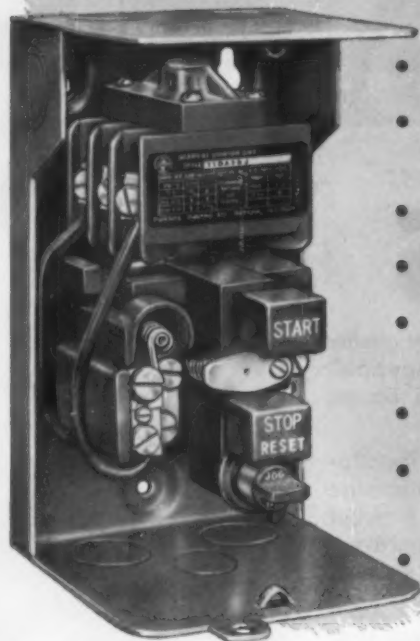
You can rely on BOSS for custom fabrication of your "specials" of any type

THE HUENEFELD CO. Engineered Products Division

2701 SPRING GROVE AVE. CINCINNATI 25, OHIO

NEW

FURNAS ELECTRIC MANUAL STARTER



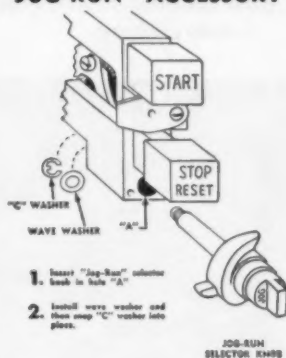
- 2-3-4 Poles
- Sizes 0 and 1;
7½ HP, AC—2 HP, DC
- Compact & Simplified
- Visible Contacts
- Pressure Terminals for
Quick Wiring
- Positive Snap Action
- Trip-Free Thermal
Overload Protection
- Modern Enclosures for
Easy Installation

✓ **SUPERIOR ELECTRO-MECHANICAL LIFE**—Only two moving parts—floating toggle and spring replace complex linkages. Unitized frame and arc box, silver-cadmium oxide contacts.

✓ **DIRECT-ACTING THERMAL OVERLOADS**—Trip-free melting alloy type assures reliable motor protection, opens contacts independent of toggle. Second overload unit snaps into place on single phase starters.

✓ **"JOG-RUN" SERVICE ACCESSORY**—The first manual starter with a "Jog-Run" accessory for fast, easy positioning.

"JOG-RUN" ACCESSORY



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A58



FURNAS ELECTRIC COMPANY

BATAVIA, ILLINOIS

SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

(69) **CIRCUIT BREAKERS.** Bulletin GEA-6881, 8 pages, gives information on new single-tank sub-transmission power breakers with ratings through 46 kv. General Electric Co.

(70) **LIQUID LEVEL CONTROLS.** 4-page brochure describes Level-Tek control system which indicates and controls a predetermined level in liquids or solids and operates remote warning devices or motor starters. Robertshaw-Fulton Controls Co.

(71) **SUBSTATIONS.** Bulletin GEA-3800D, 58 pages, describes master unit substations for handling protective, transformation and switching problems in industrial and utility power systems. General Electric Co.

(72) **SWITCHES AND ACTUATORS.** 52-page catalog ES-59 includes complete information on sub-miniature, environment-free hermetically-sealed, enclosed, and lighted pushbutton panel switches and their actuators, plus definitions of switch terminology. Electrosnap Corp.

(73) **LIGHTING FIXTURES.** New illustrated price guide No. 11 pictures line of fluorescent and incandescent equipment and accessories with list prices and discount schedule. Kenbert Arpag Co.

(74) **UNDERFLOOR DUCT.** 6-page bulletin 493 covers new designs in fittings for communication and power distribution systems. National Supply Co.

(75) **RURAL LIGHTING.** Bulletin GEA 6703A, 4 pages, outlines benefits of better lighting in rural or suburban areas with automatically controlled mercury-vapor lighting. General Electric Co.

(76) **HEAT TRANSFER CEMENT.** Service Bulletin 13 outlines use of Thermon for improving the heat transfer rate between electric heating cable or strip type heating elements and process piping vessels and equipment. Thermon Mfg. Co.

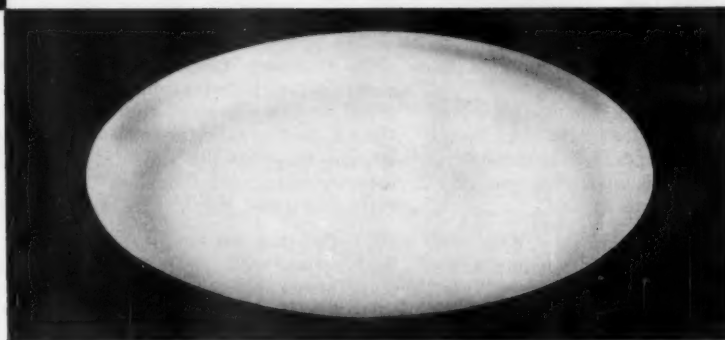
(77) **HEAT-ACTIVATED SWITCHES.** 8-page booklet MC-177 describes line of Thermoswitch controls which operate on differential expansion of metals. Fenwal Inc.

(78) **ROOF VENTILATORS.** Bulletin 246 contains performance tables, horsepower ratings, rpm information, and cfm capacities. Peerless Electric Co.

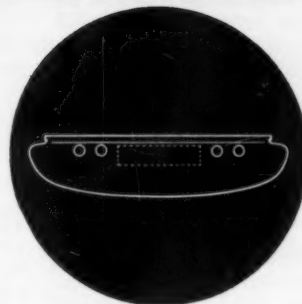
(79) **INDICATING INSTRUMENTS** and distribution and control equipment.



sculpture in light



There are good reasons why so many lighting specs hold firm for this completely new circline fixture: ARCHITECTS like the unusual sculptured look...the regressed housing that shows only a luminous surface from most angles. OWNERS like the built-in look...the frameless diffusers, hidden hinges...the economy and efficient, dependable performance. CONTRACTORS like the way these 24" square and round surface units are installed so quickly...the easy handling: no need to keep track of endless sizes and finishes...the maximum profits, minimum problems. Doesn't it make good sense to recommend and install commercial lighting by Lightolier? For a 120-PAGE CATALOG-RINDER detailing the complete architectural line, write Dept. EC-49



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Bulletin 3-610 includes oil circuit breakers, subway switches, precision balances, rotary switches, and panel, switchboard and portable instruments. Federal Pacific Electric Co.

(80) GENERATING EQUIPMENT. Four pamphlets cover technical aspects of generating plants, engines and generators, including excitation methods, hours of operation, engine fuels, and revolving fields. D. W. Onan & Sons Inc.

(81) ALUMINUM SOLDERING. New booklet includes data on fluxes, irons and flames, plus complete information on soldering methods. Reynolds Metals Co.

(82) MERCURY LAMP BALLASTS. Bulletin GEC 1467B, 6 pages, describes ballasts for outdoor lighting. General Electric Co.

(83) DRY-TYPE TRANSFORMERS. 28-page catalog covers single- and 3-phase distribution transformers to 500 kva. Hill Transformer Co., Inc.

(84) CONTROL PANELS combining sequencing, supervising, indicating and power controls for industrial processes, automation and heating applications are described in Bulletin 159. Protection Controls, Inc.

(85) DITCHER. 4-page bulletin describes engine-driven trenching tool for burying power cables, street lighting cable, substation ground wires, cathodic protection systems, etc. Charles Machine Works, Inc.

(86) EXPANSION FITTINGS. Bulletin 12 describes line of weather-tight conduit expansion fittings to relieve strain of expansion and contraction in long runs of conduit. Spring City Electrical Mfg. Co.

(87) RESIDENTIAL LIGHTING; 2 bulletins. 52-page catalog details line of Early American hanging fixtures; 12-page catalog presents new ideas in budget lighting for economy homes. Progress Mfg. Co.

(88) AC MOTORS. Bulletin B-2103-4 gives concise selection data on motors from 1 through 200 hp plus photos of special-purpose motors for unusual temperatures or atmospheres. Reliance Electric and Engineering Co.

(89) PHOTOELECTRIC CONTROLS for measuring, recording and registration are discussed in Bulletin 577, with details on application, construction and operating range. Photomation, Inc.

(90) CHURCH CONTROLS. Bulletin 5921M covers ideas on how churches can operate electrically controlled equipment at a savings in operator's time and power cost. Paragon Electric Co.

(91) VENTILATING EQUIPMENT. Catalog describes line of ventilating fans, range hoods and air circulators for residential use. Progress Mfg. Co., Inc.

(92) SILICON RECTIFIERS. Data sheet gives information on electrical and mechanical characteristics of diodes with capacities of 6, 20 and 40 amps per cell and peak inverse ratings of from 50 to 500 volts. Syntrol Co.

(93) CONTROL SWITCHES for use in conjunction with circuit breakers, transformer tap changers, motor-operated rheostats, instruments, and other apparatus. Bulletin 14B-8112B. Allis-Chalmers.

(94) MOTOR STARTERS—in central control panels. 4-page bulletin 58-C cites savings in initial costs, wiring, engineering time, and reduced maintenance costs resulting from centralized mounting. Richardson Scale Co.

(95) INSULATING TAPES and fabrics. Five new bulletins include, in tabular form, complete information on both physical and electrical properties. Continental-Diamond Fibre Corp.

(96) LIGHTING FIXTURES. Improved catalog features illustrations of each product with photometric and dimensional data; sections include indirect lighting, silvered bowl, fluorescent lighting, and exterior lighting. Silvray Lighting, Inc.

(97) RADIANT HEATERS. New bulletin F-1614 describes new ceiling type radiant heater and an angular-mounted model for spot-heating as well as large area heating problems, plus accessories such as input controllers, thermostats, and magnetic contactors. Edwin L. Wiegand Co.

(98) LIGHTING FIXTURES. New 168-page catalog shows complete lines of shielded commercials, industrials, special types, and recessed fixtures. All photometric tables are calculated by zonal interreflectance method. Lighting Dynamics.

(99) EXPLOSION-PROOF FIXTURES. Bulletin EF describes new E-series

line including pendant type, junction box type, and bracket type, suitable for use in Class I, Group C and Group D atmospheres. Rab Electric Mfg. Co.

(100) EMERGENCY LIGHTING units. 1959 catalog details equipment designed to provide power instantly and automatically upon power failure. Electric Cord Co.

(101) MOTOR GUIDE. Form 270A covers nine major factors in motor selection, with complete data on polyphase, single phase and dc machines. Line of gear motors, selective speed drives and mechanical variations are also described. Century Electric Co.

(102) OUTDOOR LIGHTING: weather-proof fixtures for spot and reflector lamps. Schematics, applications, drawings, light density tables, power and coverage graphs for each fixture. 24 pages. Moldcast Mfg. Co.

(103) TRANSFORMERS. "Curvacore" construction of 3-phase units in ratings through 150 kva, making possible reduced heights and weights, less installation time, and less mounting space. Bulletin 61B9049. Allis-Chalmers.

(104) IMPULSE TESTING of distribution transformers: pertinent technical data. Set of charts shows oscilloscope wave shapes produced by failures. 4 pages. Delta-Star Electric Div.

(105) FLOODLIGHTS. 14-section, 184-page catalog 320 covers complete line. Section headings include "How to Select Floodlights", "Hazardous Area Lighting", "Underwater Floodlights", and "Calculations". Crouse-Hinds Co.

(106) LIGHTING FIXTURES. New brochure includes specifications of 14 traditional and contemporary fixtures designed for use in living room, dining room and study areas. Globe Lighting Products, Inc.

(107) SILICONE-INSULATED CABLE. New catalog describes characteristics, applications and physical and chemical properties of Simconex cable, with heat resistance charts and current-capacity tables. Simplex Wire & Cable Co.

(108) EXPLOSION-PROOF FIXTURES, incandescent and mercury-vapor, are described and illustrated in new 8-page catalog 303. Appleton Electric Co.

EFFICIENCY IS *HIGH* WHEN THE TOOL IS A

"The Tools You Swear By... Never At!"






COMBINATION VISE STANDS

Base designed so yoke vise parts ($\frac{1}{8}$ " to $2\frac{1}{2}$ ") can be replaced by chain vise parts ($\frac{1}{2}$ " to 4"), or vice versa.

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PATENTED FEATURES

-  **JAM PROOF**
-  **AUTOMATIC "kick-out" hand or power**
-  **MANUAL "kick-out" for short threads**

Easiest and fastest pipe threader on the market today. Get a demonstration and you will see why NYE is the best.

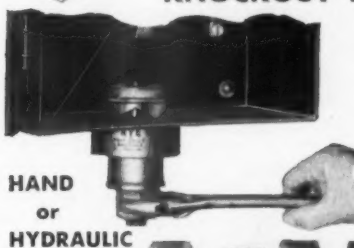
NEW HEAVY DUTY SELF LOCKING VISES

Long Jaw Vises . . . a NYE origination. All yoke type vises have a pipe rest and benders on base. Sizes $\frac{1}{8}$ " to $4\frac{1}{2}$ ".

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"FOUR POINT" BALL BEARING KNOCKOUT PUNCHES



HAND
OR
HYDRAULIC

Cuts clean burrless holes, fast. Coarse thread on screw drive (12) against (24) lessens cutting operation by 50%.

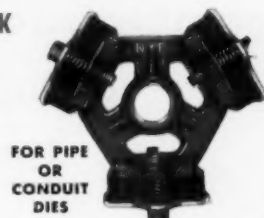


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TRIPLEX SOLID DIE STOCK

Excellent for hand or power threading. Supplied in two combinations: $\frac{3}{8}$ " to $\frac{3}{4}$ " and $\frac{1}{2}$ " to 1".

● SEE YOUR JOBBER



NYE TRIAD STOCK #50

Can be furnished for Conduit or Pipe Threads $\frac{1}{8}$ " to $\frac{3}{4}$ " and $\frac{1}{4}$ " to $1\frac{1}{4}$ ". Exclusive with NYE, the SKIP TOOTH die.

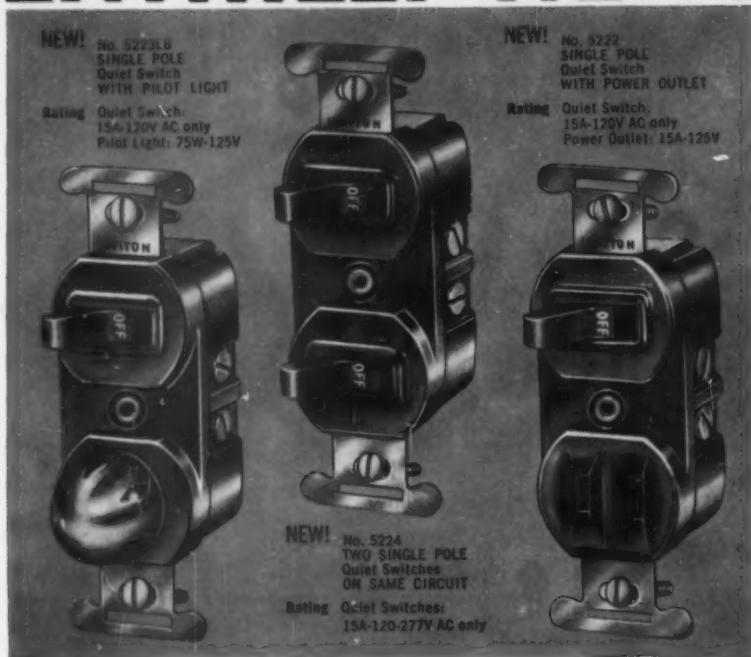


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NYE TOOL COMPANY

4122 Fullerton Avenue, Chicago 39, Illinois

ENTIRELY NEW!



Leviton is First with QUIET SWITCHES in the combination duplex line

YOUR BEST JOBS ARE DONE WITH ...



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For your wire needs, contact our subsidiary **AMERICAN INSULATED WIRE CORP.**

THE 3 MOST VERSATILE COMBINATION UNITS YOU'VE BEEN WAITING FOR! New Leviton Quiet Switches are mechanical switches, precision-balanced with heavy special silver contacts, magnetic arc-snuffing action. The movement is so quiet you can hardly feel it!

AND YOU GET ALL THESE FEATURES TOO!

- **POWER OUTLET** has bronze double-wiping contacts for longer life and pressure grip.
- **PILOT LIGHT** takes standard S-6 candelabra lamp that's easily removable. Nickel-plated protective hood over lamp.
- **RUGGED CONSTRUCTION!** Base molded of brown phenolic...covers of either brown phenolic or ivory thermosetting plastic. And heavy gauge rust-proofed underslung steel strap is riveted through cover and body to form a permanent assembly.
- **EASY TO INSTALL!** Large head No. 8 terminal screws have deep milled slots for easy wiring. Accommodate up to No. 10 conductors. Wiring diagram furnished with unit. Wide plaster ears on strap make wall alignment easier.
- **ECONOMY!** Save installation costs—no extra box and wall plate necessary. Save wall space, too—single gang wall plate replaces double gang.

WRITE FOR FULL DETAILS TODAY!

Listed by Underwriters' Laboratories, Inc.

(109) **SINGLE-PHASE MOTORS.** Bulletin 470-B describes motor line available in ratings from $\frac{1}{4}$ to 20 hp in open protected, totally enclosed fan cooled, and explosion-proof frames. Robbins & Myers, Inc.

(110) **MAGNETIC CONTACTORS** for air conditioning and refrigeration rated in 20-, 30- and 40-amp sizes, 2-, 3- and 4-pole, open type or general purpose Type 1 enclosures, are covered in Bulletin 41-B1. Contactors with same ratings rated both in current and horsepower are described in Bulletin 41-B2. Furnas Electric Co.

NEW BOOKS

1959 National Electrical Code, proposed text (Report AR 2). National Fire Protection Assn., 60 Batterymarch St., Boston 10, Mass. \$1.25; free to NFPA members.

This is the complete proposed text of the 1959 Code, incorporating both changes in substance and editorial changes, which will be presented before the NFPA annual meeting at Atlantic City, N. J., in June, where final changes may be voted. Schedule calls for final publication of the Code in September, 1959.

Electrical Engineering Materials, by A. J. Dekker, 208 pages. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. \$8.00.

A complete discussion of methods and models used to determine the properties of materials most important to the electrical engineer. Dielectric, magnetic and conductive properties are treated separately, with practical exercises to which the reader can apply his knowledge of elementary field theory.

NEMA Standards. The following recently published standards are available from the National Electrical Manufacturers Assn., 155 E. 44th St., New York 17, N. Y., at the prices indicated:

Motors and Generators (MG 1-1959); \$10.00. Revised book is divided into 14 parts covering definitions, specification data, definite-purpose motors, synchronous motors, dc generators, synchronous generators, M-G sets, and ac and dc motors over 200 hp.

Molded Case Breakers (AB 1-1959); \$0.40. Standards cover air breakers, single- and multiple-pole, assembled as an integral unit in a housing of insulating materials, up to and including 600-volt ac, 250-volt dc.

A jewel of a fixture

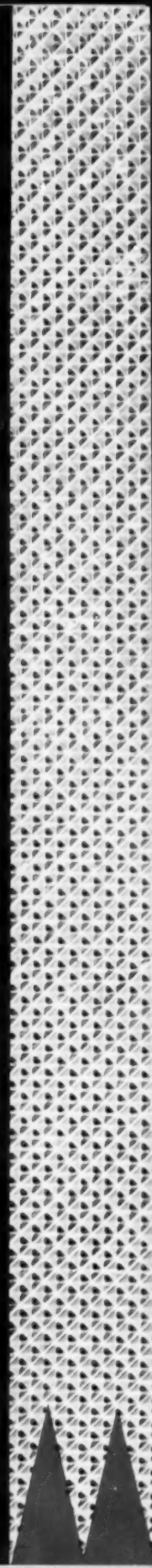
at a down-to-earth price



the wonderful WAKEFIELD

prismatic

Below: Actual size photograph of clear plastic lens



the wonderful

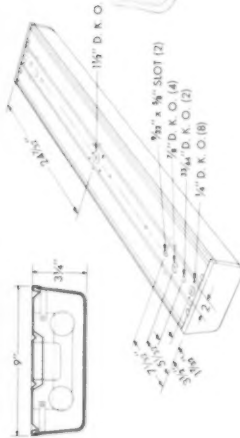
WAKEFIELD® prismatic

TRADE MARK

...is wonderful because it goes practically everywhere...installs

in a jiffy...has beautiful panoramic styling...

is priced to delight the user and for volume selling...



Catalog Number	No. of Lamps	Description	Std. Wt.—lbs.		Pkg. Quan.
			Pkd.	Unpkd.	
R-214	2-F40T12/RS	Wakefield	16	14	1
		Prismatic	30	28	2

If your customer needs approximately 50 footcandles, install *one* Prismatic for every 40 square feet of area.

Suggest to your customer that he paint his ceiling white and his walls a light color.



Tear out this page—it's perforated for your convenience.



Thousands of interiors are waiting for the Wakefield Prismatic. It's a natural for virtually all commercial, office and institutional areas. A beautiful, practical, inexpensive four footer with graceful one-piece clear plastic lens diffuser. All steel parts are white-enamelled. Takes two Rapid Start lamps. Installs easily directly on the ceiling, singly or in continuous rows. IBEW, UL/CSA labeled. Jefferson CBM/ETL, HPF ballast.



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WAKEFIELD

THE WAKEFIELD COMPANY — VERMILION, OHIO
WAKEFIELD SOUTHWEST COMPANY—OKLAHOMA CITY, OKLA.
WAKEFIELD LIGHTING LIMITED—LONDON, ONTARIO

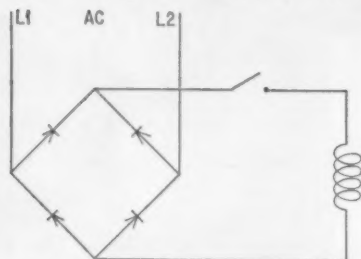
Data Sheet 2-59

Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repairs. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay \$5.00

Rectifiers for Electric Brake

QUESTION M35—We have had to replace quite a few rectifiers for an electric brake wired as shown in the diagram. Would a discharge resistor



across the coil remedy our trouble, or would it be advisable to connect the switch in the ac line instead of the dc side of the rectifier as it is now?—J.J.L.

ANSWER TO M35—I cured this problem by insulating the rectifiers from the ground, and installing closely rated Fusetrans on the ac side. This will protect the rectifiers from an overvoltage through the insulation and a current overload if a ground or short comes on. Some rectifiers do not like certain fumes, and high temperatures, so protect the rectifier from heat and fumes.—H.S.

ANSWER TO M35—When a coil is energized a magnetic field builds up so that it will oppose any change in the current establishing that field. When the circuit is interrupted the magnetic pressure from the field generates a transient current pulse which is opposite to the direction of the current. In your scheme this means that the discharge current is forced to flow opposite to the direction of rectification, consequently it bears the danger of burning out the rectifier unit by overheating it.

To remedy this situation it is essential to establish a path for the discharge current other than through the rectifier. This can be done by placing a resistor across the coil to dissipate the discharge energy but such resistor will also draw current from the line during operations of the brake increasing thereby the power losses.

A better method would be to place the switch on the line side and put a capacitor or a resistor-capacitor combination across your rectifier unit so that it will form a series resonant circuit with the coil. This way the discharge current will charge up the condenser, then upon its discharge the energy will be dissipated through the resistance of the circuit. The value of the inserted capacitance and resistance will, of course, depend upon the parameters of the circuit, mainly the coil size of the brake.—A.F.R.

ANSWER TO M35—The main trouble that J.J.L. is complaining about is the fact that his rectifiers are continually burning out. The trouble arises from the single switch which is now employed. When the circuit is broken at the switch, there is a sudden rise in voltage. This voltage may reach the value of the peak inverse voltage value of the rectifiers, hence burning them out.

My remedy would be a switch in the ac line (if more than 110 volts ac source, I would use two switches, one on each line L1 and L2).

If J.J.L. desires accurate shut down of the brake coil, he must consider Lenz's Law. When the power through the coil is shut off, there will be a collapsing of the coil field and a counter emf will result. Instead of a resistor he suggested, I would recommend a short circuit around the coil which will be operated by the same starter switch in the supply lines. This combination switch would likely be a 3-phase manual starter or equivalent.—S.Y.

Preventive Maintenance Program

QUESTION N35—In our plant we have been conducting an electrical preventive maintenance program involving periodic inspection and regular overhaul of equipment.

A critical look is being taken at our maintenance costs and we are questioning the economics of our program. No doubt there is a point of diminishing returns in any pre-

ventive maintenance program or a large part of it could be eliminated, and it would be more economical to operate equipment to failure before repairs are made.

I would appreciate hearing opinions from your readers on this subject.—R.E.B.

ANSWER TO N35—With the recent recession came a reappraisal of plant operating costs, and this, of course, includes maintenance costs.

Two years ago, we instituted what we termed as our "crash maintenance program". This has caused a drastic change in our mode of thinking, but by now we have conditioned ourselves to it and find it rather profitable.

The "crash maintenance program":

(1) New installation receives no electrical maintenance until failure occurs, then temporary repairs followed by replacement when unit can be shut down.

(2) Repairs are limited to expensive devices, cheaper ones replaced outright.

(3) Sealed bearings used in all motors, eliminating bearing lubrication.

(4) New electronic installations use static devices, transistors, etc. No vacuum tubes.

(5) Circuit breakers replace all fuses.

(6) All new motors are totally enclosed with sealed bearings. The end result: preventive maintenance eliminated, paper work greatly reduced, supervision at a minimum and savings increased.—J.A.M.

ANSWER TO N35—Your "point of diminishing returns" must be determined by diligent study and experience; for each plant, like each individual or each family group, has a degree of uniqueness. In cooperation with the production manager, determine which pieces of equipment are critical to production and the order in which each piece becomes less critical to production. Balance the cost of breakdown with the cost of preventive maintenance for each piece of equipment. If your study and research are truly analytical, and if

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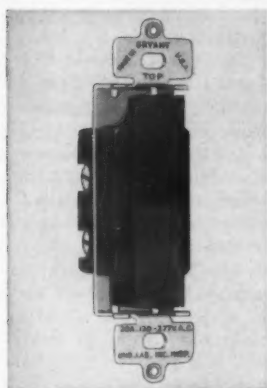
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Tap-Eez is the exciting new companion switch to Fashion Plate.* Its appearance is modern . . . the new, slim, tap-action bar blends well with design. More important, the attractive flush mounting makes it easy to clean . . . perfect for commercial applications where the

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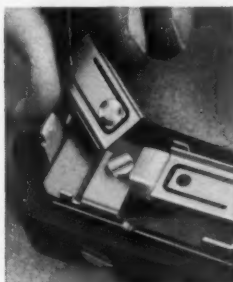
Tap-Eez has positive action, low maintenance and whisper quiet operation . . . no teasing . . . no arcing. Its service is more reliable than ordinary toggle switches . . . really built to last!

ASK YOUR BRYANT DISTRIBUTOR for a sample of Tap-Eez. Take it apart and see the built-in quality . . . the trade-mark of Bryant superior wiring devices.

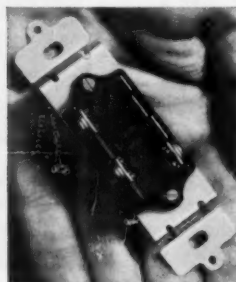


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NOW...GLOBE OFFERS... two new **INTERCHANGEABLE** trays for support of cables, wiring and tubing

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Now, for the first time, two types of cable trays, one a ladder type and the other a basket type, are available to be used **INTERCHANGEABLY** at any given location, depending on the type and weight of the cables to be suspended. The advantages of each type tray can thus be used to the fullest extent. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is intended for the support of communication wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants, in modernization, and for power distribution in all types of manufacturing processes. A new catalog, just off the press, gives full information and installation techniques. Ask for your **FREE** copy today.

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accurate records are honestly kept, your point will reveal itself in time. Until you *know*, keep the entire plant on preventive maintenance.—W.R.S.

Voltage Drop at Lighting Panel

QUESTION P35—In designing industrial plant electrical systems, I have several times encountered exhaust fans with motors of 5 hp or more in drafting rooms and office areas, with the only nearby panel being a 120/208-volt, 3-phase lighting panel.

Is there any "rule of thumb method" for determining the maximum size motor that could be fed from a 3-pole circuit breaker on any given lighting panel, without causing a noticeable flicker in the lighting?—R.V.H.

ANSWER TO P35—As there are no sizes given for the panel or feeder or for the existing load or the proposed additional load, a slightly different approach than usual must be used.

First: it must be assumed that the proper size panel has been installed, and that the proper size feeders and protective devices are also used.

Secondly: there must be some spare capacity in both the feeders and the panel (as you cannot add any load to an already loaded panel or conductor.)

A perusal of Article 384 of the National Electrical Code will clarify some other points that must be considered. Will the panel be classified as a lighting and appliance panel? Does the panel contain snap switches, or just protective devices? Will the panel be rated at 125% of connected load?

If all conditions are as they should be, then 125% of the motor load, added to the existing load (which has been properly computed) will give you the total load that will be on the panel. This total load must be within the limitations allowed by the NEC. Therefore before any load is added it is suggested that the local inspection authorities be consulted.

Field experience has shown that there is a tendency to load circuit feeders and panels to their capacity when they are installed, thus leaving no room whatever for additional future loading. Any error in calculations might better be towards lighter loads and to large conductor sizes than the reverse condition.—C.L.

ANSWER TO P35—The feeder supplying the lighting panel is involved as well as the panel. Assuming that the service equipment is of sufficient capacity, the feeder must have a current-carrying capacity equal to 125% of the full load current rating of the motor plus the branch circuit lighting load. The panelboard should be rated at not less than 125% of the total load; or, in other words, load the individual circuits at only 80% of rated capacity. By rule-of-thumb, then, if the desired motor, when added to the lighting load, will result in a total load of not over 80% of the ratings of the panelboard and of the feeder, there should not be an appreciable amount of flicker. Of course, this applies to motors with comparatively low starting currents, such as capacitor motors. The breaker used for the 3-phase motor must be a 3-phase breaker and not three single-phase breakers tied together.—W.R.S.

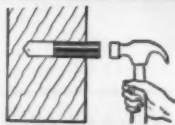
Motors Reverse Direction

QUESTION Q35—At one of the mining properties, my attention was called when all 3-phase motors operated in reverse direction. The incoming line from the power company is 23000 volts, which had not been tampered with. From there we step down to 2300 with 3 delta connected transformers. At this point we have 75 kvar of capacitors connected to the lines, also a single phase 2300 to 230-115 lighting transformer. This is then connected to three transformers with delta connections (2300 to 480 volts). All 3-phase power to motors is taken from the 480-volt taps. Why did these motors reverse direction after every one was stopped?—E.H.

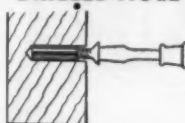
ANSWER TO Q35—In any 3-phase distribution system under certain conditions reversal of 3-phase motors can occur. The number of 3-phase motors that will reverse will be all motors from the fault to the end of the line, providing there is not too great an increase in motor size in the sequence in which they are started.

If any one phase of a 3-phase system opens circuit, such as a blown fuse, one leg of a circuit breaker burned off or a burned off cable, then from the fault to the end of the line there would be single phase power available. Now if one motor

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INSERT SCREW!

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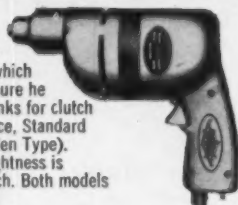
SIoux

POWER

Electric Drills

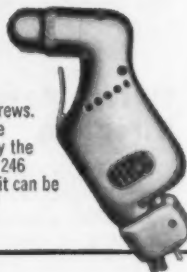
NO. 260 - 262

On No. 260 Super Screwdriver the operator controls the tightness with which a screw is set by the amount of pressure he applies. The $\frac{1}{4}$ " Hex Drive takes shanks for clutch head screwdriver bits, Reed and Prince, Standard screws, Phillips, and socket head (Allen Type). On the No. 262 Super Screwdriver tightness is pre-determined by adjusting the clutch. Both models equipped with reversing switch.

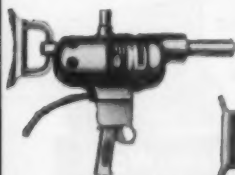


NO. 242

It fits the hand, and operates in restricted space like no other electric screwdriver. It quickly drives or removes all types of screws. No. 242 has a positive clutch; the operator controls the tightness by the amount of pressure applied. No. 246 has an adjustable clutch, so that it can be preset for any uniform degree of tightness desired.

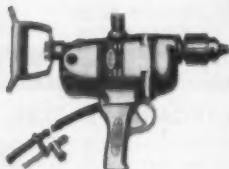


SIoux ELECTRIC SCREWDRIVERS



**1" H.D. DRILL
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**$\frac{3}{8}$ " & $\frac{1}{2}$ "
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No. 1560, 1575**



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No. 1550**

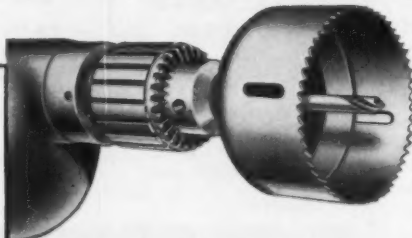


**$\frac{1}{2}$ " STD.
DUTY DRILL
No. 1510**



**$\frac{3}{8}$ " & $\frac{5}{16}$ "
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will cut holes from $\frac{3}{8}$ " to 6" in diameter, in any free machining material to a depth of $1\frac{1}{2}$ ". Alloy or stainless steel may be cut at slow speed. High-Speed teeth welded to chrome-vanadium body give maximum life and cutting ability.

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Catalog Number	No Load Speed	H.P. and R.P.M. at Load Speed	Oz. Ft. Torque at Load Speed	H.P. and R.P.M. at Peak Load Speed	Oz. Ft. Torque Peak Load
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1480	1600	7/64 1140	7.9	5/32 790	16.8
1485	1650	3/32 1060	6.9	1/8 620	16.7
1495	1650	3/32 1060	6.9	1/8 620	16.7
1498	400	3/16 275	45.0	9/32 215	108.0
1510	525	27/64 370	95.0	39/64 230	222.0
1517	925	13/32 670	49.0	9/16 540	135.0
1519	1250	13/32 860	37.5	9/16 500	96.0
1525	1650	5/16 1060	31.0	3/8 680	45.0
1541	925	13/32 670	49.0	9/16 540	85.0
1548	525	27/64 370	95.0	39/64 230	222.0
1550	525	7/16 325	108.0	17/32 175	252.0
1560	400	9/16 260	175.0	3/4 155	400.0
1575	400	3/4 205	308.0	1-1/8 125	748.0
1579	350	49/64 200	315.0	1-9/64 115	800.0
1472	1600	13/64 960	17.8	17/64 720	32.4
1473	950	13/64 575	31.6	17/64 430	55.0
1474	625	13/64 375	44.6	17/64 280	84.2
1477	950	13/64 575	31.6	17/64 430	55.0
1478	625	13/64 375	44.6	17/64 280	84.2
1479	1600	13/64 960	17.8	17/64 720	32.4



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You know what it will do!

The Horsepower and torque for each Sioux drill is rated, stated, and certified. It isn't necessary to buy just a drill. When it's a Sioux you know what it will do. See the power specifications for Sioux Electric Drills in this advertisement.

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Super Powered **1/4" and 3/8" DRILLS!**

Here is super power to provide all the torque necessary for any operation where this type of drill would normally be used. (See specifications) And there's a speed for every need. It's an entirely new design in which the brushes have been located at the fan position at front of the drill. The advantages include cooler running, and easier inspection and replacement of motor brushes without partial or complete disassembly of the tool. Ball and roller bearing construction, with finest precision gears and mechanical design have achieved a new high in output efficiency.



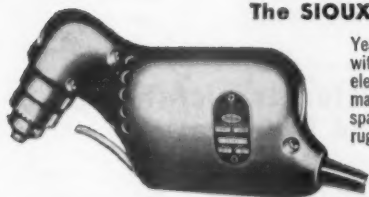
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Year after year this is a top seller in the SIOUX line. It's popular with almost everyone—auto mechanic, sheet metal worker, electrician, shipbuilder, woodworker, assembly line, factory maintenance man. It fits the hand and operates in restricted space like no other tool. It's a most convenient handful of rugged power.



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**1/4" H.D. DRILL
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BALL BEARING**



**1/4" H.D. DRILL
No. 1480 SEMI
BALL BEARING**

**1/2" LT.
DUTY DRILL
No. 1498**



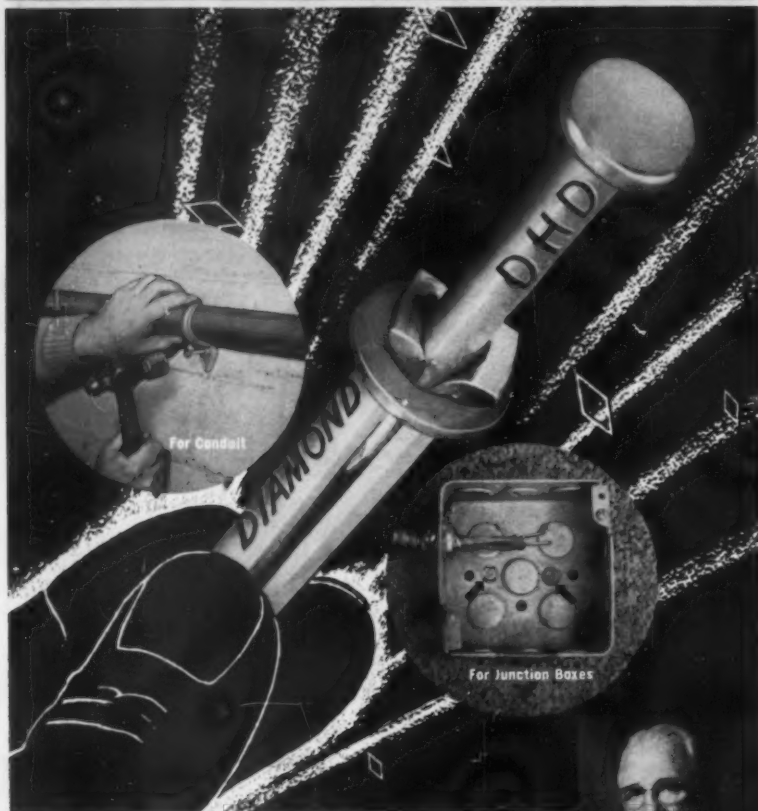
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ONLY thru your wholesaler, whose stocks of all Diamond Anchors enable you to get fast delivery service. This policy plays an important part in your ability to get contracts done faster and profitably.

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GARWOOD, NEW JERSEY



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from the fault to the end of the line were driving an exhaust fan, so that atmosphere air could drive it backward when the power is off, on applying the available single phase power to this motor it would come up to speed in the reverse direction and continue to run backward so long as the overload protection device does not trip. Once this motor is running backward, and on the line, it will establish a reverse 3-phase voltage sequence in the portion of the line beyond the fault.

Any additional motors which are started will run reversed providing the second motor started is either smaller than the first motor or not too large in comparison to the first motor started.—J.H.P.

ANSWER TO Q35—You did not say what you did to correct the trouble, so I will give you a couple of possibilities.

With one of the 480-volt feeder phases open and another load, that you haven't mentioned, on the 480 supplying the out of phase current, the motors could reverse when started. This has happened to me.

Another possibility is an open phase on the 2300-volt ahead of the capacitor bank. The capacitors would then supply the out of phase current to start the motors in reverse.—W.E.G.

Motor Acceleration And Deceleration

QUESTION R35—We have in our plant two conveyors; one feeds material into a steel-cutting saw and one removes material from the same saw.

Each conveyor is powered by a 5-hp. 1800-rpm, 3-phase motor without brake. Each motor is controlled by a magnetic reversing starter, it being operated with a forward and reverse momentary contact push-button.

Is there any method whereby we can control motor acceleration and deceleration to obtain smoother starting without replacing motors and control? Pushbutton operation is preferred.—E.S.J.

ANSWER TO R35—A simple scheme that would allow a smooth operation for acceleration would be to interpose between the motors and the control a small motor-driven rheostat that would act as a variable series resistor in the line. Then, when the motor is started the series resistor would start at maximum resistance and within a few



JOHN A. WRIGHT
Vice President

seconds swing over to short circuit. It could be so arranged with a small torque motor and a spring return so that the resistor always started at maximum resistance value.—H.H.S.

ANSWER TO R35—Yes, there is a method whereby you can control motor acceleration and deceleration for smooth operation. As you well know, acceleration is dependent upon the available torque, i.e., the difference between motor torque and load torque. Further, torque varies as the applied voltage squared.

Therefore, to reduce acceleration or deceleration the motor applied voltage must be reduced. This is very simply accomplished by inserting resistance in the motor circuit. At 90% voltage the starting torque is 81%, which usually gives smooth starting. This resistor may be left in the circuit or jumped out by a relay when the motor comes up to speed.

For deceleration, a plugging switch should be added. The starter and the motor need not be replaced.—J.A.M.

Can You Answer These QUESTIONS

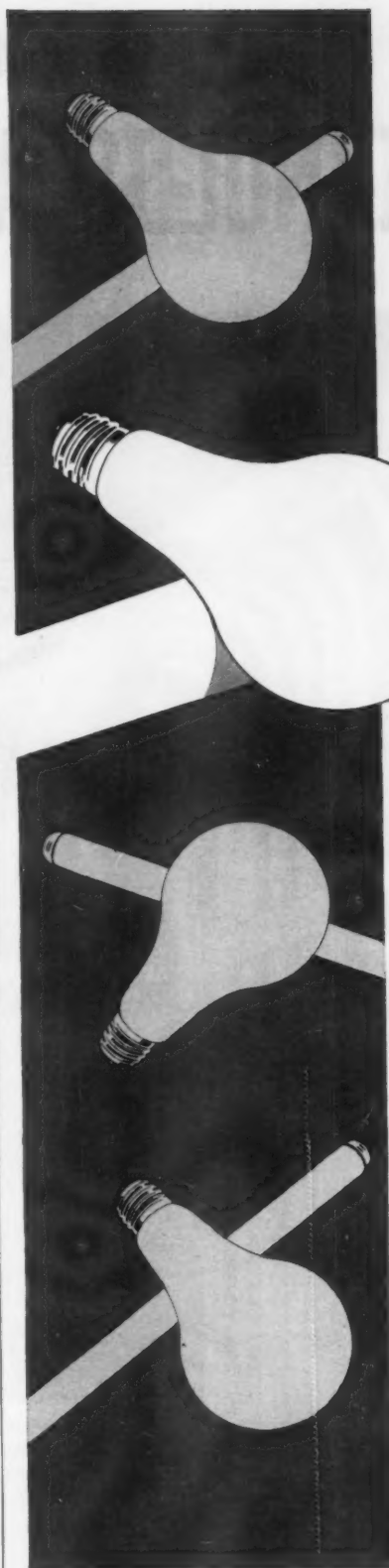
QUESTION C36—I wish to establish a ground on an existing 3-phase 480-volt ac power system for elimination of surge voltages due to ground faults. What is the best and most practical methods of doing this?—W.E.G.

QUESTION D36—When two single phase wattmeters are measuring power and power factor on a 3-phase circuit, are meter readings adversely affected if power is received at a low power factor?—G.J.P.

QUESTION E36—What are the advantages of dc plugging of a 3-phase ac motor over ac plugging? Which imposes the least severe conditions on the motor and which is the recommended method for fast stops?—J.M.

QUESTION F36—Where can we obtain graphs or tables to use in determining short circuit currents at a particular fault in circuits in the 110- to 13,200-volt range in alternating currents?—S.G.F.

PLEASE SEND IN YOUR ANSWERS BY MAY 15



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brands of lamps
CHAMPION
stands out for
VALUE

VALUE THROUGH UNIFORMITY:

Uniformity in Champion lamps is guarded by over 200 inspections on the more than 3,000 different lamps available to satisfy the diversified lighting needs of factories, stores, homes, office buildings, streets, etc.

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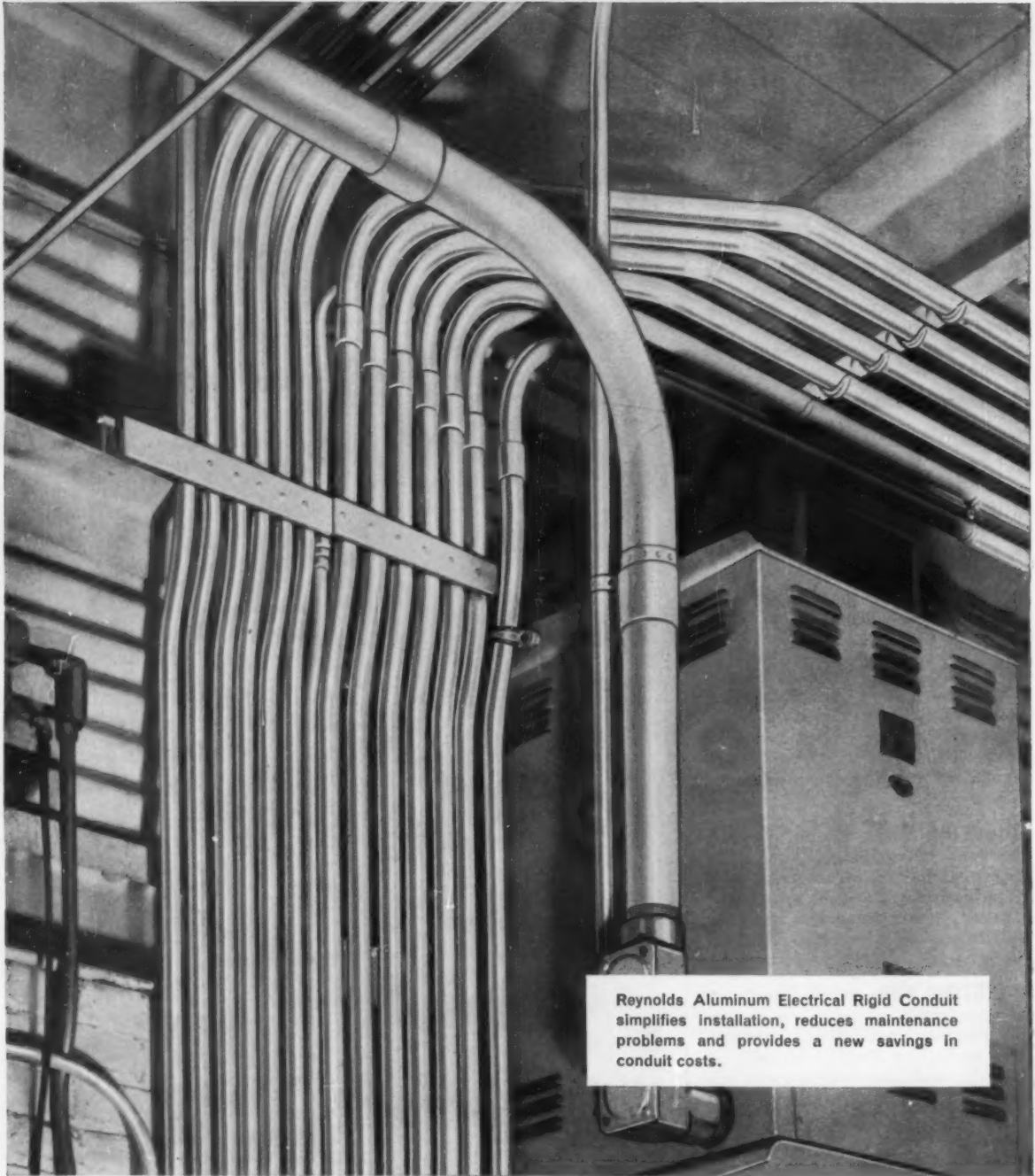


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cut your installation and **REYNOLDS ALUMINUM**



Reynolds Aluminum Electrical Rigid Conduit simplifies installation, reduces maintenance problems and provides a new savings in conduit costs.

maintenance costs with **ELECTRICAL RIGID CONDUIT**

Lightweight! Non-Corrosive! Competitive in Cost!

Weighing $\frac{2}{3}$ less than steel conduit, easy-to-handle Reynolds Aluminum Conduit cuts installation time and costs. Yet, Reynolds Aluminum Conduit is now more competitive with steel conduit in original cost! And aluminum can be used in so many

ways, in so many places without the constant care steel requires. Imbed it in concrete, store it for long periods of time, expose it to weather—Reynolds Aluminum Conduit just cannot rust. Consider these benefits and the dollar savings they represent:

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Let's take a concrete example. A 10-foot length of 3-inch aluminum conduit weighs just 27 pounds—in equivalent steel, 69 pounds! Reynolds Aluminum Conduit is easier to handle, so it's faster to install.

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Reynolds Aluminum Conduit is corrosion resistant to water, weather and most industrial atmospheres. There are no replacement worries due to rust . . . no periodic protective maintenance problems . . . no rust on walls or surrounding fixtures . . . no rusting of threads.

Non-Magnetic

Reynolds Aluminum Conduit is non-mag-

netic. Voltage drop is reduced—makes possible smaller conductors or longer runs in many cases.

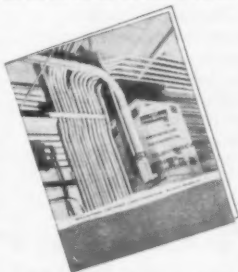
Non-Sparking

Excellent for use in inflammable areas and atmospheres, Reynolds Aluminum Conduit won't spark from accidental contact blows from hard objects.

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No special tools or installation equipment needed. Bending is easier too, because aluminum "sets"—less spring back. And, the interior surface is coated to make wire pulling easy.

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For more information and names of Reynolds Aluminum Electrical Rigid Conduit outlets, call your nearby Reynolds Sales Office or write Reynolds Metals Company, Box 2346ET-4, Richmond 18, Virginia. Also write for descriptive brochure.

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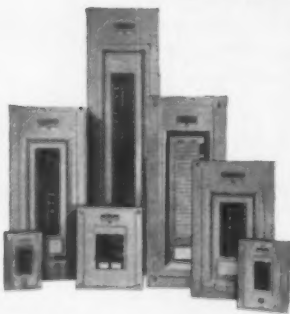
are made with
REYNOLDS ALUMINUM

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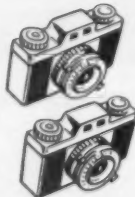


You won't lose profits on service complaints, you won't have unhappy customers, if you buy circuit breakers on performance, *not* on claims. That's what thousands of profit-minded contractors will tell you about C-H Unit Breakers.

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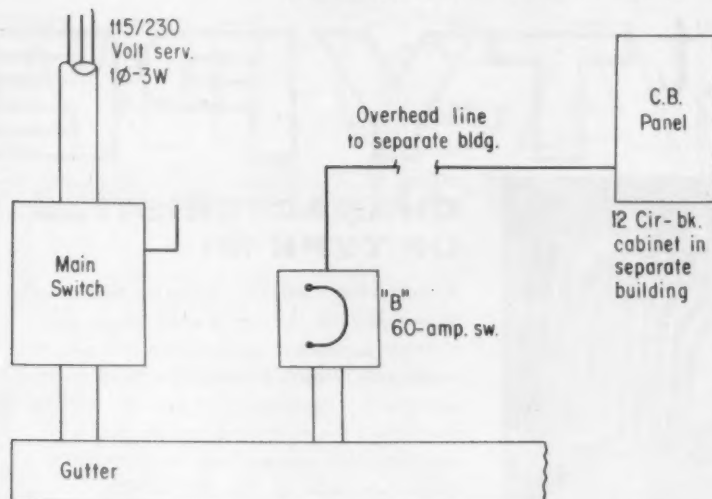
Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation.

Questions on the Code

Answered by:

B. A. McDONALD, New York Board of Fire Underwriters, Rochester, N. Y.

B. Z. SEGALL, Consulting Electrical Engineer, New Orleans, La.



Disconnects—Separate Buildings

Q. On the illustration "B" is a 60-amp pullout that serves an overhead run to a second building under the same ownership. In the second building, a 12-circuit breaker cabinet will be installed. Is a 60-amp disconnect required ahead of the 12-circuit cabinet located in the second building?—R.C.M.

A. Section 2351-d covers this question. It reads as follows:

"Disconnecting Means. More than one building. In a property comprising more than one building under single management, the conductors supplying each building served shall be provided with a readily accessible means, within or adjacent to the building, of disconnecting all ungrounded conductors from the source of supply. In garages and outbuildings on residential property the disconnecting means may consist of a snap switch, suitable for use on branch circuits, including switch controls at more than one point."

Previous to the 1946 code this rule, under Section 2306 of the 1940 code read as follows:

"Master Services. In a property comprising more than one building under single management, and which has a generating plant or is

served by a master service, the conductors running from one building to another shall not be considered as service conductors; but the wiring in each building served shall be separately controlled and properly protected by overcurrent devices. The control should be a circuit breaker or an enclosed externally-operated switch, which may be located in the building served or in another building, provided it is accessible to the persons using the installation."

Garages and outbuildings of residences come under this Section.

According to the 1940 code the disconnecting means could be located in the building served or in another building. The 1946 and 1956 code requires the disconnecting means to be "within or adjacent to the building." The term "adjacent to the building" provoked considerable speculation with respect to the intent of this wording. Would a switch located in a building 100 or 200 ft away be considered adjacent to the building served? As a result of such questions Official Interpretation No. 313 was issued December 10, 1948. It reads as follows:

"Section 2351-d. Interpretation No. 313. Issued December 10, 1948. Disconnecting Means in Residential Garage.

"Question: With respect to a garage, is it necessary to construe the term 'adjacent to the building'

of paragraph d, Section 2351 so as to prevent placing the disconnecting means at the house instead of at a detached garage on the same premises?

"Finding: NO. The intent was to follow the practice specified in the 1940 edition of the code."

This interpretation indicates that the disconnecting means may be located in the building served or in another building, provided it is accessible to the persons using the installation. Regardless of code rules, many design engineers require the disconnecting means to be located in the building served.—B.A.McD.—4/59/1

Residential Grounding Type Receptacles

Q. Next to the last sentence in Section 2124b reads "Receptacles installed in or on open porches, breezeways, garages, and the like which may supply equipment to be used by persons standing on the ground shall be of the grounding type." Would this rule apply to:

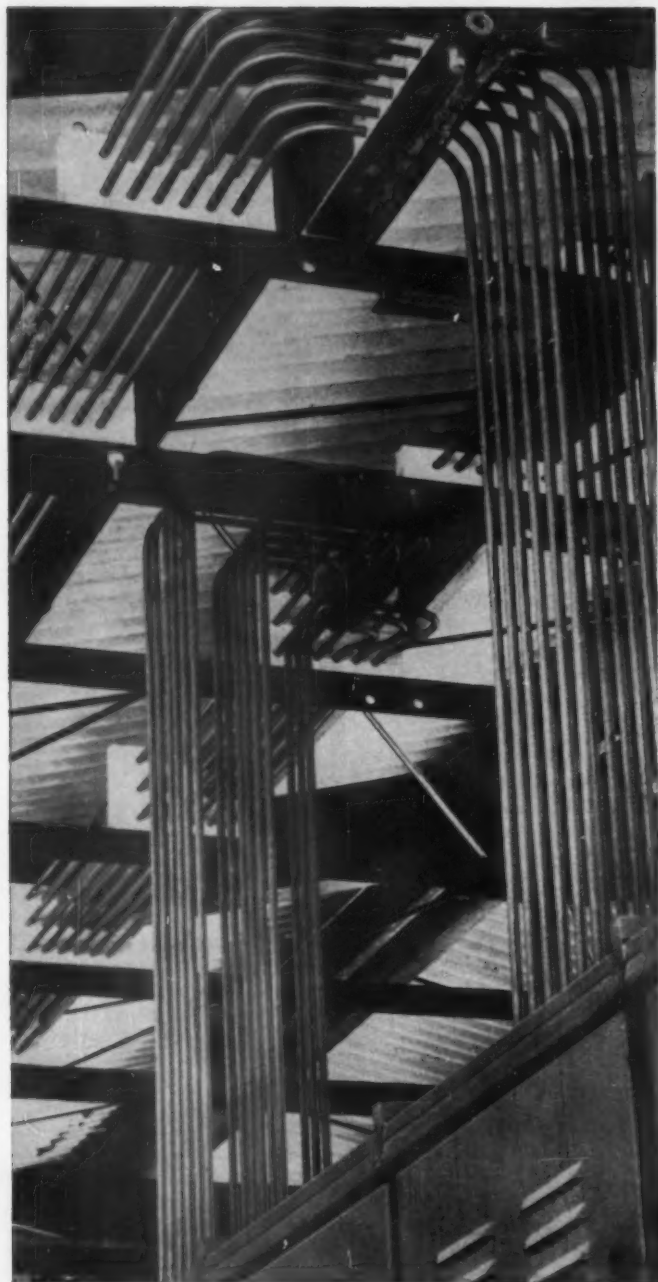
1. Receptacles in a room in a dwelling with a concrete slab in direct contact with the earth?
2. Receptacles in a basement of a dwelling with an earth floor?
3. Receptacles on the outside of buildings other than dwellings?—C.T.

A. The proposed changes for the 1959 code will clarify the intent of this section to a great extent. This proposed rule will now read:

"Only grounding type outlets shall be installed in laundry rooms, open porches, breezeways, basements, cellars, work shops, garages, on the exterior surfaces of outside walls or in like locations where the outlet may supply equipment used by persons standing on the ground or on grounded conductive materials. These outlets shall be installed in accordance with Sec. 210-7."

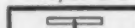
With reference to your first question it should be noted that the last phrase in the above would cover

what you should know about TYPE



CHARACTERISTICS OF TYPE MI

1. **Just what is MI?** Here's how the NEC describes MI (Article 330): "A cable in which one or more electrical conductors are insulated with a highly compressed refractory mineral insulation and enclosed in a liquid-tight and gas-tight metallic tube sheathing." The conductors and the sheath are electrolytic copper. The mineral insulation is magnesium oxide. MI IS UL APPROVED.
2. **What's so unusual about it?** Since it is of all-mineral construction—copper and inert magnesium oxide—it is not subject to normal destructive influences such as heat, moisture, sunlight, oils, etc.
3. **Is it flame-proof?** Absolutely. Magnesium oxide is non-flammable and will not support combustion.
4. **What are its temperature limits?** MI may be operated continuously with ceramic terminating seals at temperatures as high as 250°C (482°F). For a "one-shot" application it may be operated at temperatures as high as the melting point of copper (1083°C). Routine Code applications which use standard terminating seals should be kept at 85°C (185°F) in the termination area.
5. **Is it moisture-proof?** Yes. The seamless copper sheath is impermeable to moisture. Properly applied end seals completely seal against moisture.
6. **Why is it electrically safer?** A grounded wiring system is safer than an ungrounded one. It is impossible to install MI properly without effectively grounding it.
7. **What is the current rating of MI?** For general use, the rating is determined by the standard end seals, which are rated at 85°C (185°F).
8. **What is the working voltage of the system?** The maximum working voltage is 600 volts AC or DC. Factory test voltage is 2500 volts.



MI CABLE

FOR 600-VOLT APPLICATIONS

9. What's the normal life of an MI wiring installation? MI will outlast the structure in which it is installed.

WHERE MI IS USED

10. Can MI be installed in industrial plants? It is ideal for industrial installation, because it eliminates downtime and repair work due to cable failures. MI IS UL APPROVED FOR HAZARDOUS LOCATIONS.

11. Is it useful in any type of industry? It certainly is, particularly because of its resistance to heat, moisture, oils, chemicals and other harmful influences. Successful installations have been made in pulp mills, glass factories, printing plants, chemical plants, petroleum refineries, ships, coal mines, dairies, breweries, steel mills, and many others.

12. Where else is MI used? Because of its small space requirements (no conduit or duct is required), safety and neat appearance, it has been used in schools, museums, commercial buildings, hospitals, research laboratories, and in machine tool wiring.

HOW MI IS INSTALLED

13. Is it difficult to install? No, it is very easy to install. All you have to do is cut it to length, train into position and secure it by standard clamps or straps to any surface. No conduit or duct is needed. It is easy to terminate and attach to standard boxes or equipment.

14. Can it be used with other wiring systems? Yes: MI is perfectly compatible with other wiring systems.

15. Are special boxes or equipment attachments required with MI? No. You can attach it to all standard electrical boxes, enclosures and equipment. Threaded MI cable fittings in the four standard

conduit group sizes and having standard conduit threads may be ordered with the cable.

16. Do you need special tools? Only two: a sheath stripper and an end seal crimping tool. Both are available from General Cable. Except for these, regular electricians' tools are all that are needed.

17. Does MI bend easily? You can bend it by hand in the smaller diameters. In larger sizes, a standard bending tool or "hickey" will do the job easily.

18. Is special training needed to install it? No. A qualified electrician can do it simply by referring to the instructions in the Instruction Manual included with each shipment.

19. Where can fittings be obtained? Fittings may be ordered with the cable in the quantity desired. They'll be delivered with the cable.

20. How about delivery? Most sizes are available from stock. The local General Cable office nearest you can give you full details.

Ask any General Cable Authorized Distributor or your General Cable Representative—at any one of the 65 General Cable offices coast-to-coast—to pinpoint actual installations of Type MI in plants comparable to your own. For a free copy of the new 12-page Type MI Catalog, just write Dept. EC-4.

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this, viz "... or in like locations where the outlet may supply equipment used by persons standing ... on grounded conductive materials."

The second question is also covered since the new requirement applies to basements in dwellings.

This Section 2124b is not applicable to your third question since this section specifically applies to "Dwelling Occupancies." However 2545c would require the use of grounding type receptacles in these other types of occupancies.—B.Z.S. —4/59/2

BX Cable

Q. Does BX cable satisfy the requirement for metallic raceway?—F.R.M.

A. We must first clarify our terms so that we may discuss this question on an acceptable basis. "BX" cable is not a generic term but just one trade name for the general classification of a wiring method recognized in the Code in Article 334 as "Armored Cable."

In the general definition of a "Raceway" as shown in Article 100, this type of wiring method is definitely not included in the listing of recognized raceways.

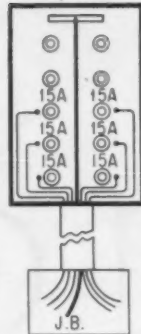
Furthermore, it must be recognized that, in general, a raceway would permit, within reasonably practical limitations, the removal of old wires, cables or busways and the reinstallation of new wiring, cables or busways, at any time after the original installation has been completed.

Armored cable would require the complete removal of the entire assembly since the conductors contained within the flexible metallic covering are pretty much locked into the covering to form a tight and integral assembly.—B.Z.S. —4/59/3

Branch Circuits—Common Neutral

Q. As shown by the illustration, we have one white neutral (No. 8) common to six circuits. Conduit sizing is correct and has no bearing on the problem. The question is, can a common neutral be used for this many branch circuits? This job happens to be a school building, but is it not similar to factory installations where a conduit is run from a panelboard containing the branch circuits up to a junction box near the ceiling

3-wire, 120-240 v



7 conductors in one conduit. One neutral No. 8 feeding 6 circuits of No. 12 conductors fused at 15 amps.

At junction box, 2 No. 12 were carried to different parts of building. Neutrals all spliced together. This is a new installation. Is not the common neutral in violation of the code?

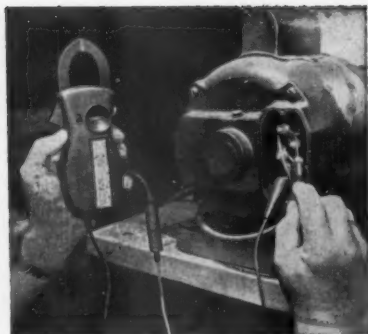
which contains a terminal block for the connections of all the neutrals? This conduit would then contain the "hot" branch circuit conductors and one neutral of sufficient current carrying capacity. Or has this practice been a violation of the code?—R.C.M.

A. Prior to the 1940 edition of the code, the use of a neutral common to more than one branch circuit was recognized in varying degrees by the code for several years. Section 2113 of the 1937 code read as follows:

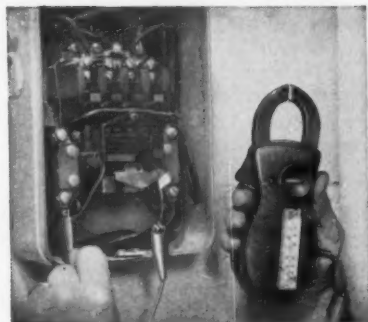
"2113 Common Neutral. A common neutral conductor may be employed for two or more branch circuits provided not more than eight ungrounded conductors are used. Such a common neutral conductor shall have a carrying capacity at least sufficient for the current of the maximum unbalanced load. The same number of circuits shall, as nearly as possible, be connected between the neutral conductor and each of the other conductors of the system. If the circuit conductors are installed in conduit or other metal enclosure, all conductors of the group shall be installed in the same conduit or enclosure."

This provision was deleted in the 1940 code. As a result, such procedure is no longer recognized except for outside wiring on a single pole or structure as covered by Section 7312. Section 2204 recognizes a neutral conductor common to more than one feeder. In view of the foregoing, it appears that the installation described is in violation of a code rule which specifically limits the procedure to installations described in Section 7312.

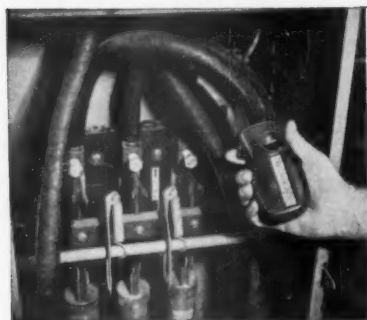
Insofar as industrial installations are concerned, there are no exceptions. In the case cited however there would be no occasion to carry the neutral of the feeder down to the panelboard. It would terminate in the junction box which contains a terminal block



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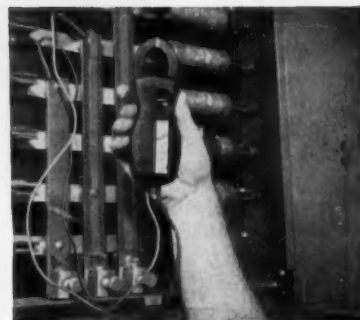
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which also provides terminals for the branch circuit neutral conductors. Under such conditions, the only wires entering the panelboard would be the phase conductors of the feeder and the branch circuits. There would be no neutral conductor common to several branch circuits. Such a junction or pull box should be approved by a recognized laboratory such as UL.

In applying this principle, one of our manufacturers has developed narrow panels combined with wireways which enclose all phase conductors from the panelboard to the junction box. All of the three components of this system are approved by UL. While the number of conductors in a wireway is limited to 30, the fact remains that the correction factors specified in Note 4 of Table 1, of Chapter 10, do not apply. When conduit is used the current-carrying capacity of the No. 12 conductors, shown on your illustration, would be reduced from 20 to 16 amps.

It appears however, in the case under question that the feeder enters the panelboard and the No. 8 neutral conductor is carried to the junction box with the branch-circuit conductors. If this is correct, there is, in my opinion, a code violation.—B.A.McD.—4/59/4

Hazardous Liquid Listing

Q. Would you recommend a listing of all hazardous liquids and gases with the flash points in the new edition of the National Electrical Code?—G.A.M.

A. Such a listing is already available. It is included in the National Fire Protection Association's National Fire Codes, Volume I, entitled "Flammable Liquids, Gases, Chemicals and Explosives." This volume is itself quite as large as the NEC. In addition this is only one of many correlative volumes to the NEC containing material which is referred to in the code but not actually contained in the code itself. To include all this material would enlarge the present NEC far beyond its present one-volume format.

This listing is shown in the chapter entitled "Fire-Hazard Properties of Flammable Liquids, Gases and Volatile Solids." The listing shows the chemical name and formulation, the flash point, ignition temperature, explosion limits, specific gravity, vapor density,

boiling point, a UL classification based on grading the relative hazards of these liquids, and an indication as to the extinguishing agents suitable for use on fires in the materials listed.

A comparison of the explosive limits of listed materials in Section 5002 of the code to the explosive limits of materials that may not be in this listing will enable you to quickly classify these unlisted materials. The UL classification number will also enable you to establish the classification if this number is available for the particular liquid or gas in question.—B.Z.S.—4/59/5

Receptacles in Commercial Garages

Q. The following question concerns interpretation of Section 5105-F-1 of the 1956 edition: How can a standard commercial type receptacle meet the requirements of the subject section of the code? It appears to me that if a defective portable appliance or lamp containing a short was plugged into a standard type receptacle, an arc could occur which would very likely cause sparks or hot metal particles to fall into the hazardous area.

I have never seen a garage which had any special type of "arc-tight" receptacles or "guards or screens" on standard type. Is this section of the code ordinarily just overlooked or am I incorrectly interpreting the subject section?—G.C.

A. For the benefit of our readers the provisions of Section 5105-F-1 reads as follows:

"F. Equipment Above Hazardous Areas.

"1—Equipment which is less than 12 ft above floor level, and which may produce arcs, sparks or particles of hot metal, such as lamps and lampholders for fixed lighting, cut-outs, switches, receptacles, charging panels, generators, motors, or other equipment having make and break or sliding contacts, shall be of totally enclosed type or shall be provided with suitable guards or screens to prevent escape of sparks or hot metal particles."

A literal reading of this rule indicates that a receptacle is an arc producing device, and when installed within 12 ft of the floor shall be of the totally enclosed type, or provided with suitable guards or screens. The terms "totally enclosed" or "provided with suitable guards or screens" usually are asso-



MEET THE MAN

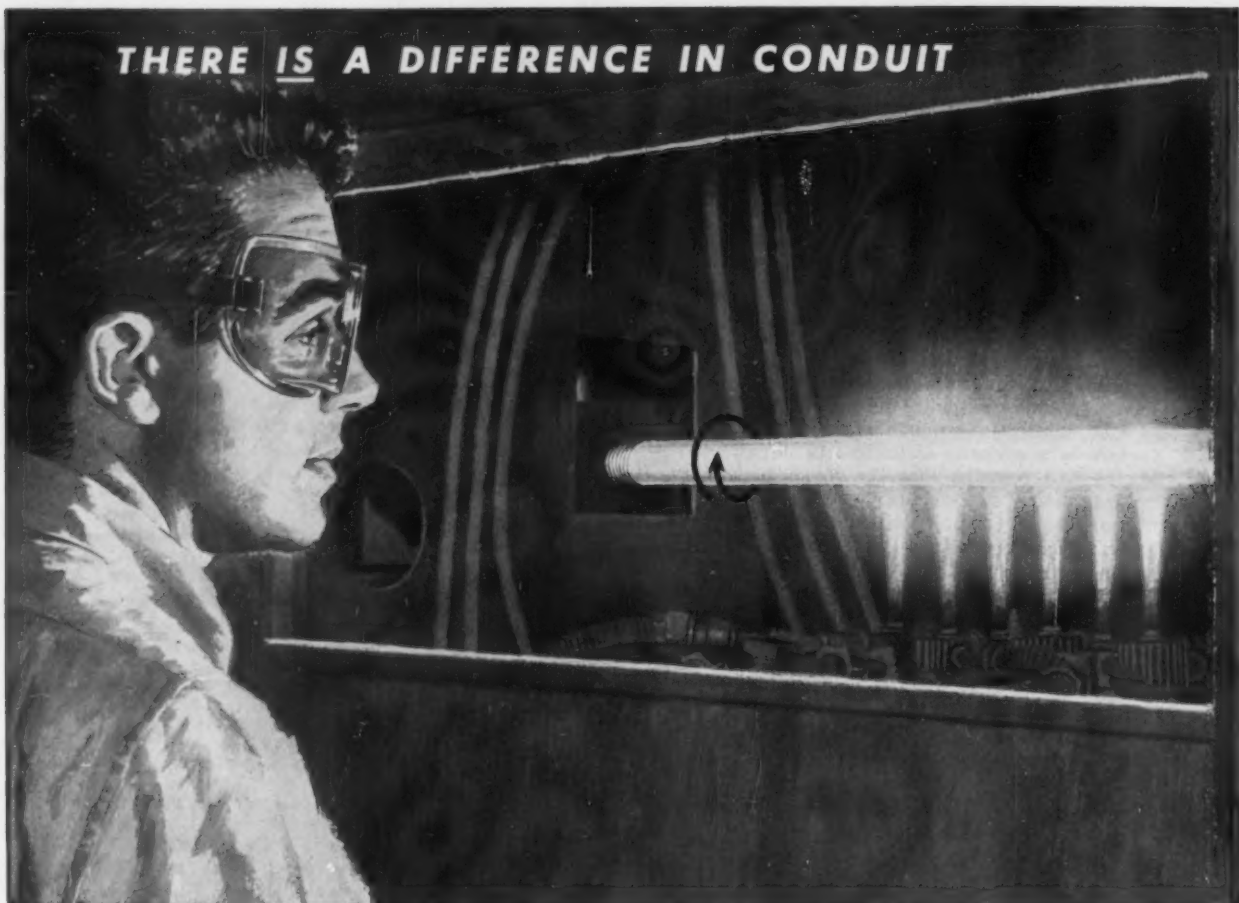
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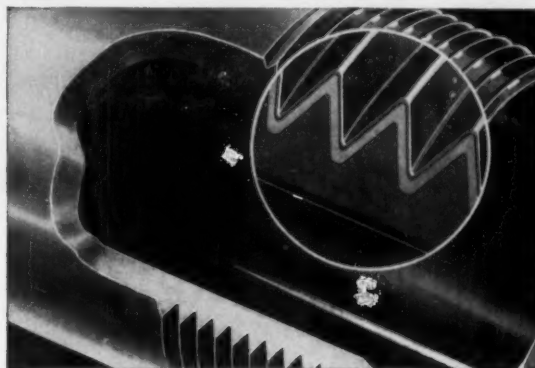
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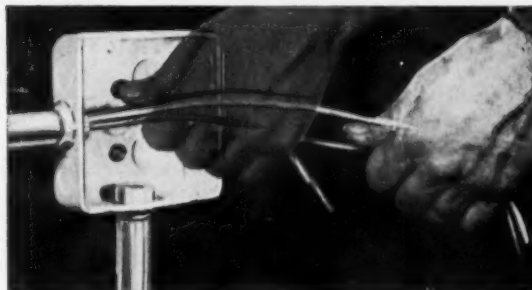
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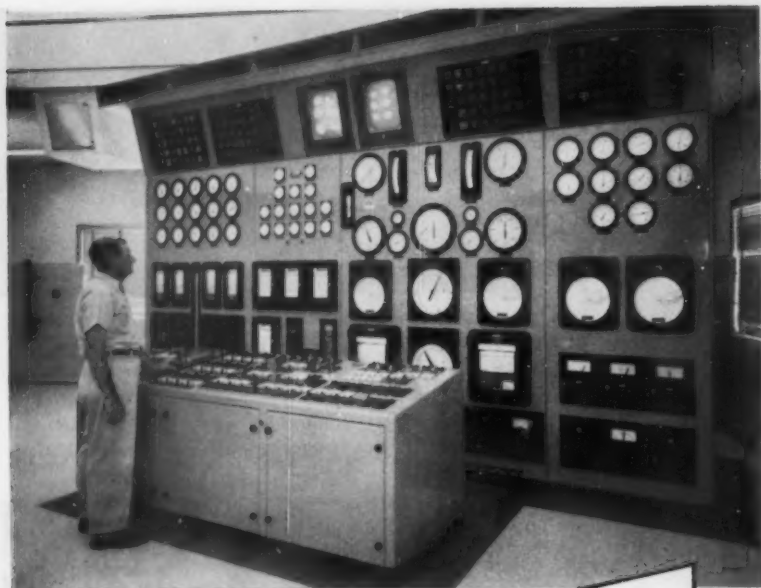


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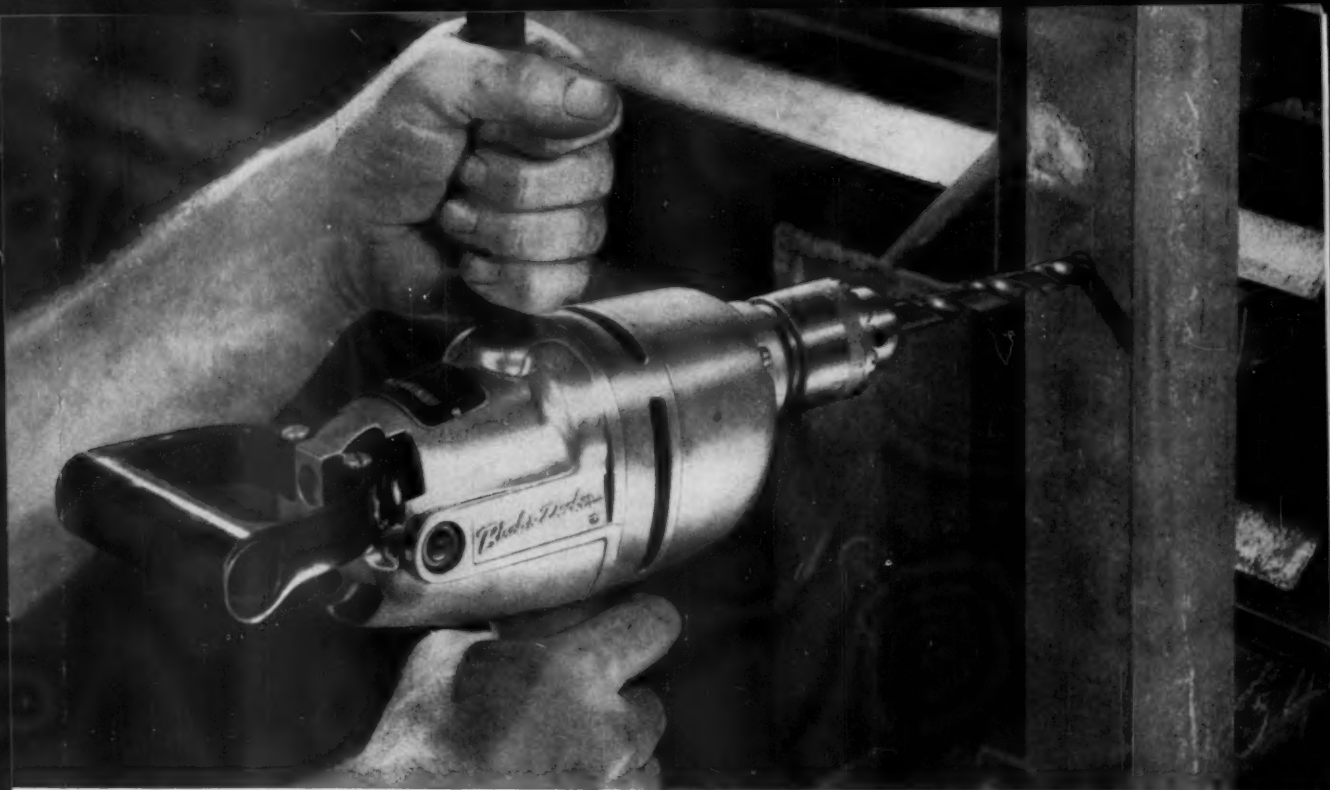
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ciated with some types of motors and generators which under normal conditions of operation produce arcs and sparks continuously. We know the meaning of a "totally enclosed" switch or a motor, but such a term associated with a receptacle raises a question which, as you infer, is difficult to visualize. Since the point of contact between a plug and a receptacle is recessed, it appears to me that the resulting arc, when contact is made or broken, is enclosed within the receptacle. As a result, it is my opinion, on the basis of code intent, that a conventional type of receptacle is all that is required when a receptacle is installed above the 18-in. hazardous area of a garage.

There is a considerable distinction in hazard when a receptacle is installed in the hazardous area and when it is installed above the hazardous area. According to Section 5105-c, a receptacle installed within 18 ins. of the floor of a garage is located in a Class 1, Div. 2 location, and it must satisfy the provisions of Section 5022 which requires that it be approved for a Class 1 location. Such approval involves the use of delayed action plugs and receptacles, or receptacles interlocked with switches, as listed by UL. In this case the receptacle is within the hazardous area and may be surrounded by a hazardous concentration of flammable gas. Under such conditions, any arc will ignite this gas and a serious explosion or flash fire could result.

When the receptacle is located above the 18-in. hazardous area, the occasion for the accumulation of flammable gas is considered to be remote, and the arc which results from the normal use of a conventional type of receptacle is not hazardous since it occurs in a non-hazardous area. The provisions of Section 5105-f however concern the hazard which results when an arc, spark or hot metal drops into the hazardous area and ignites the flammable gas. As an example, the hot filament of a broken lamp could cause an explosion which may be averted if the lamp is totally enclosed and protected from mechanical injury. This 12-ft. distance above the floor of a garage is based on the assumption that sparks or hot metal resulting from a fault would become harmless after traveling a distance of 12 ft. As a result there is no restriction on equipment located more than 12 ft above the garage floor.

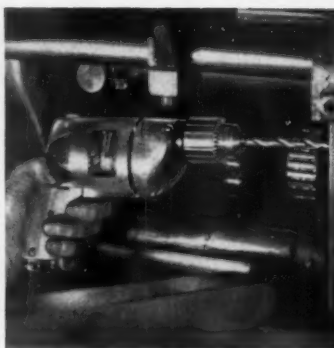
There is however a hazard which might result when abnormal conditions, such as you depict, prevail.



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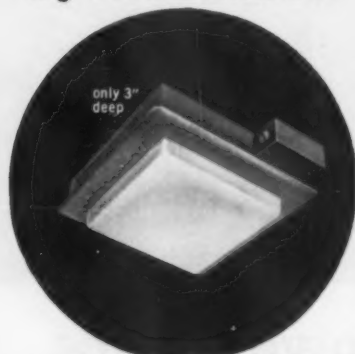


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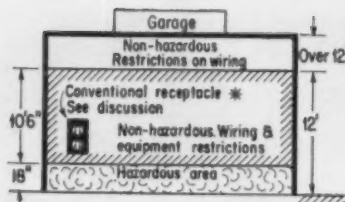
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1-Hazardous area. Receptacle located in this area must be approved for a Class I location. Section 5105-C and 5022.

2-Area 12' above floor. Non hazardous. Receptacle must be of the totally enclosed type or provided with suitable guards or screens to prevent escape of sparks or hot metal particles. Section 5105f-1.

3-Area above the 12' limit. No restrictions on equipment. Wiring restrictions 5105-e.

*Grounding type, 5022.

A short circuit in an appliance or a portable lamp when connected to a receptacle, could result in considerable arcing depending upon the nature of the fault and the size of the overcurrent device in the circuit. It appears to me however that the arcing would occur at the appliance rather than at the receptacle and to make the matter worse, the appliance may be laying on the hazardous floor of the garage. Such a combination of circumstances presents a hazard far greater than that presented at the receptacle. If the circuit is properly protected the fault should be cleared without abnormal arcing. The situation is somewhat similar to that which results when a short circuit occurs in a cord. Considerable arcing and sparks could result, which in turn could ignite the flammable gases within 18 ins. of the floor. While the code recognizes this hazard by requiring cords to be approved for hard usage, it does not see fit to deny the use of cords, which when overfused and under short circuit conditions could promote a hazard.

Section 5105-F-1 first appeared in the 1953 edition of the code, and I know of no inspection authority who has interpreted the intent of its provisions to deny the use of conventional receptacles located above the 18-in. hazardous location. In order to safeguard the hazard which you visualize, it would be necessary to use a receptacle approved for use in a hazardous location, and if the code intended to safeguard such a questionable hazard, a definite statement should be made. I do believe however that this section of the code with respect to receptacles should be clarified. The provisions of Section 5105-G, which concerns the charging of electrical vehicles, recognizes the use of cords with cord connectors designed so

that they will break apart readily, provided the connectors are outside the hazardous area. It appears to me that the hazard presented by such procedure is far greater than that presented when a fixed receptacle is installed in a wall above the 18-in. limitation. See illustration. —B.A.McD.—4/59/6

Lighting—Hospitals

Q. 1. Do fluorescent fixtures mounted 8 ft above operating room floors have to be connected to an isolated transformer?

2. Do fluorescent fixtures mounted 8 ft above the operating room floor have to be connected to a ground detector?

3. If the above is affirmative how can we compensate for ground leakage where several operating rooms are connected to the same isolating transformer or panel?—B.R.

A. It is important to note that both the two definitions in Section 5135a and the two classifications of hazardous areas in 5135b should be studied before a definite answer is given to these questions.

Assuming that the operating room comes solely within the scope of Section 5135b2, then the hazardous area extends only up to the 5-ft level. The present requirements of Section 5135f1 would seem to indicate that the fluorescent fixtures would have to be connected to the isolating transformers, etc., (ungrounded distribution systems) and of course tied in with the ground detector.

This, however, will be clarified in the 1959 code, if the proposal is adopted. It is proposed to add a new section in this code which will permit the connection of these fluorescent fixtures to the generally grounded distribution systems which are permitted in other parts of the hospital. It is realized that if such equipment is out of the defined area (above the 5-ft level) and it is also out of reach of the operating room personnel (generally above 8 ft) the grounded system introduces relatively no hazard within the operating room.

Also the use of fluorescent fixtures with their circuit interconnections by means of capacitors, etc., make it quite difficult to design and operate the ground-contact indicators.

This new section will permit (1) fixed lighting, and (2) permanently installed X-ray transformers and associated equipment to be sup-

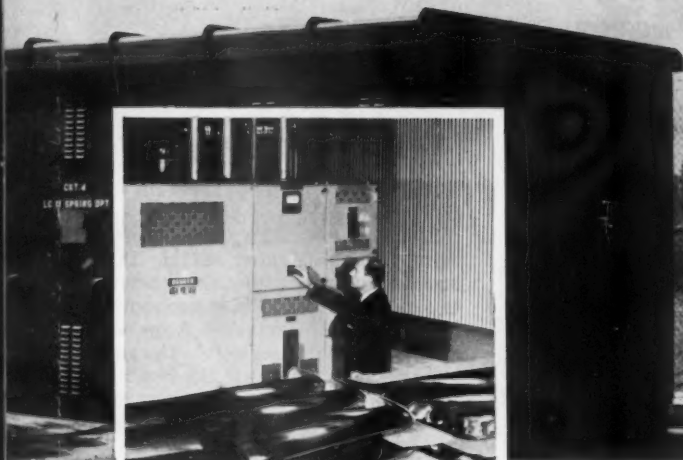


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... on page 194



plied from grounded distribution systems. This section specifically exempts the fixed lighting employing ceiling suspended or ceiling mounted surgical fixtures. These are usually always in contact with the operating personnel who have to continually adjust these fixtures during operating procedures and therefore must be in contact with the fixtures. These surgical fixtures must, therefore be connected to the ungrounded systems.

To use the grounded system the following requirements are provided:

1. Wiring for the grounded and the ungrounded systems shall not occupy the same raceways.

2. The lighting fixtures and the X-ray equipment shall be located at least 8 ft above the floor. This 8-ft clearance does not, however, apply to the "enclosed X-ray tube and the metal enclosed high voltage leads to the tube."

3. Switches for the grounded circuits shall be located outside the anesthetizing location. One exception is permitted. These grounded fixtures may be controlled from remote control stations within the anesthetizing locations, if the remote control circuit to the remote control switch is energized from the ungrounded distribution system.—B.Z.S.—4/59/7

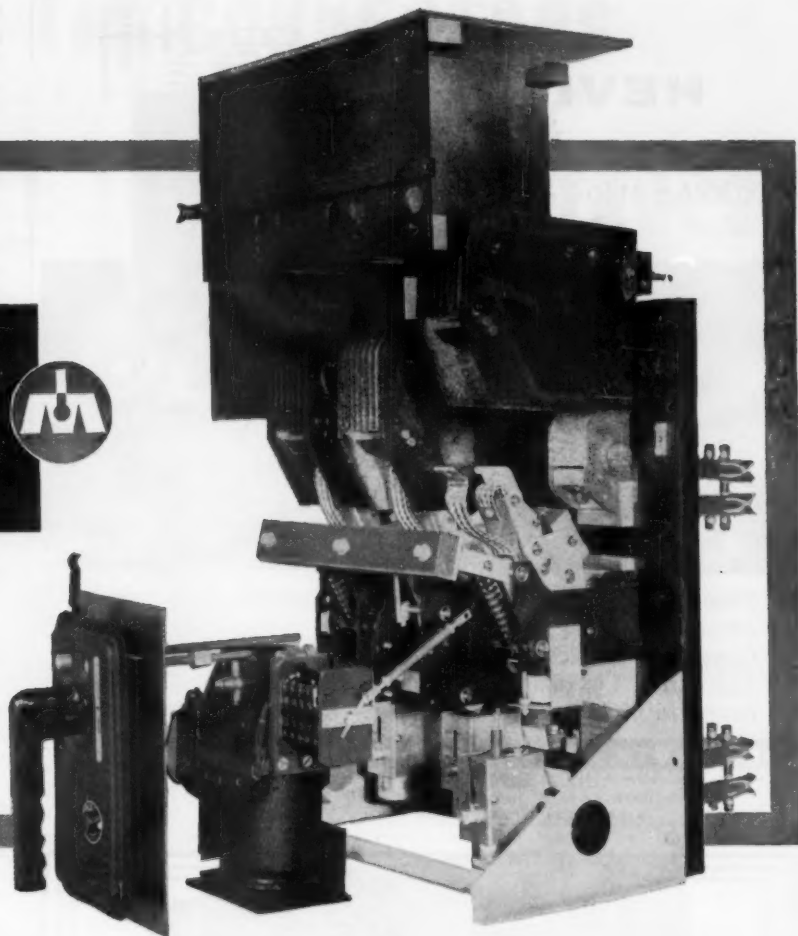
Church Wiring— Epilogue

In the February 1958 issue of ECM I briefly discussed the problem of wiring for low voltage wiring in remote control systems installed in churches seating more than 100 persons. H. H. Watson of the General Electric Co. has written as follows, relative to this discussion:

"In the February 1958 issue of Electrical Construction and Maintenance a question on the installation of low voltage remote control conductors in churches having more than 100 seats was discussed by Mr. Segall. The low voltage wiring of a remote control system may be of two types. Class I, wiring where the low voltage power supply is not limited, is required by Art. 725 to be in accordance with a recognized wiring method. Therefore, when installed in a church having 100 seats Class I wiring must be in a metal raceway. The code puts no restriction on the type of conductor which may be used on a Class 2 system in which the total

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low voltage energy is limited by transformer output or other means. There is no requirement for the use of a recognized wiring system. It can be concluded therefore that Class 2 wiring in this same church is not required to be installed in a metal raceway but may be installed as cabled assemblies or other similar arrangement in the same fashion that annunciator or telephone circuits are installed. Many large churches and other places used for public assembly have been built or rebuilt with remote control of lighting circuits using Class 2 wiring for the low voltage circuits installed in other than metal raceways and accepted by the responsible inspector. The selection of maximum current and voltage values for the low voltage power supply when these remote control systems were first designed was made to permit open and random wiring in fire resistant structures."

Mr. Watson does make a very definite case for his contention. I know installations are being made as he states in his discussion. I also may be somewhat inclined to agree with him in principle. However, I would like to point out that Section 5211 (new 520-4) has specifically exempted two classes of installations, viz., "... exception (1). for Article 640 (Sound Recording, etc.) and for Article 800 (Communication Circuits).

One of these, Article 800, covers the example of telephone circuits which Mr. Watson presents. The second example of annunciator circuits would come properly in the scope of the same Article 725 mentioned by Mr. Watson and as indicated there is no specific exemption for this Article 725 in this Article 520.

A statement of intent from both Panels 15 and 16 or possibly a clarification of this point by some revision of this Section 5211 would help to clear up this matter.—B.Z.S.—4/59/8

**Circuit Breakers
In Multiple**

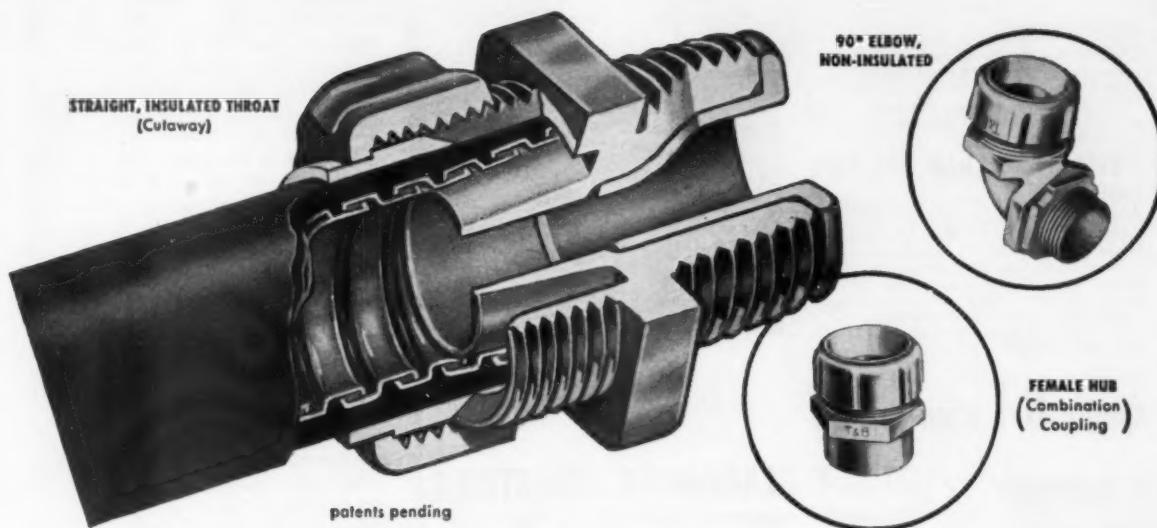
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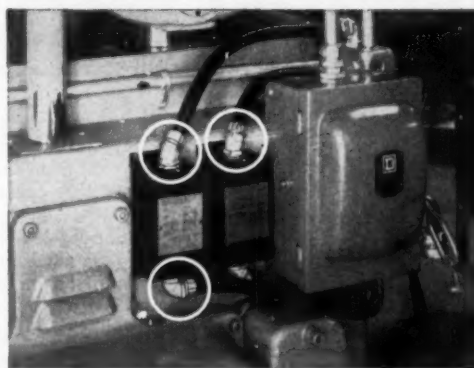
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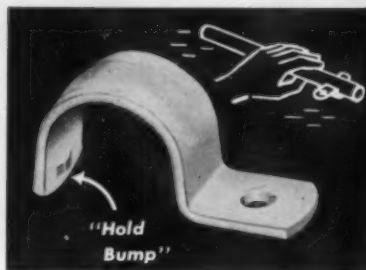
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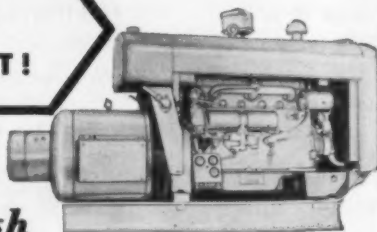


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100-amp breakers be bussed on the load side to serve one 200-amp feeder without violating the letter or the intent of the code?—L.A.W.

A. The use of circuit breakers in multiple, as described, violates in my opinion both the letter and the intent of the code, and there are several reasons why such procedure should not be recognized. Section 2411 recognizes fuses in multiple as an exception to that which is desired, but cannot be obtained when feeders rated greater than 600 amps are involved. To be specific the provisions of Section 2411 read as follows:

"Fuses in Multiple. For the protection of conductors having allowable carrying capacities exceeding the rated capacity of the largest approved cartridge type fuse (600 amps), cartridge fuses arranged in multiple may be used, provided as few fuses as possible are used and the fuses are of the same type, characteristics, and rating, and provided the fuseholder terminals are mounted on a single pair of bus bars, or have an equivalent arrangement that will eliminate any potential difference between the terminals of the fuses."

Since the largest enclosed cartridge fuse is rated at 600 amps, it appears evident that some exception must be made if fuses are to be recognized for protecting circuits or feeders rated greater than 600 amps. In the case of circuit breakers, no exception is necessary since they are available at ratings greater than 600 amps. If the code intended circuit breakers to be used in multiple, I believe a code rule similar to Section 2411 would appear in the code. Possibly a fine print note, reading as follows should be inserted at the bottom of Section 2411:

"Circuit breakers shall not be installed in multiple."

While the occasion for the exception for fuses may be justified on the basis of minimum code requirements, the fact remains that fuses in multiple must be so arranged that the total current in a feeder will be very evenly divided over the two or more fuses in multiple. If such a balance cannot be obtained and assured by proper maintenance, we may expect the needless blowing of fuses, and possibly the subsequent tampered fuse hazard. Similar considerations would be involved if circuit breakers were used in multiple, and since there is no occasion to recognize such procedure, the code does not provide for such a use.—B.A.McD.—4/59/9

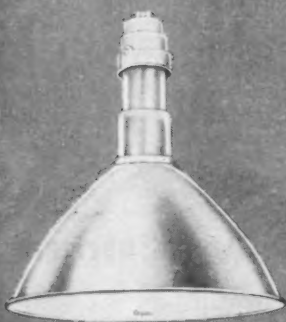
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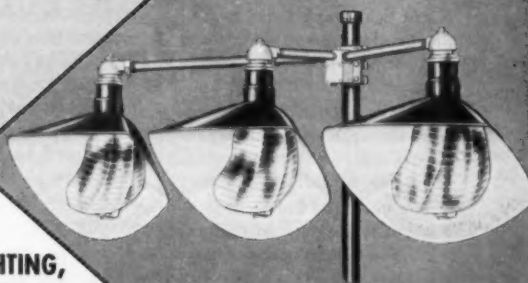
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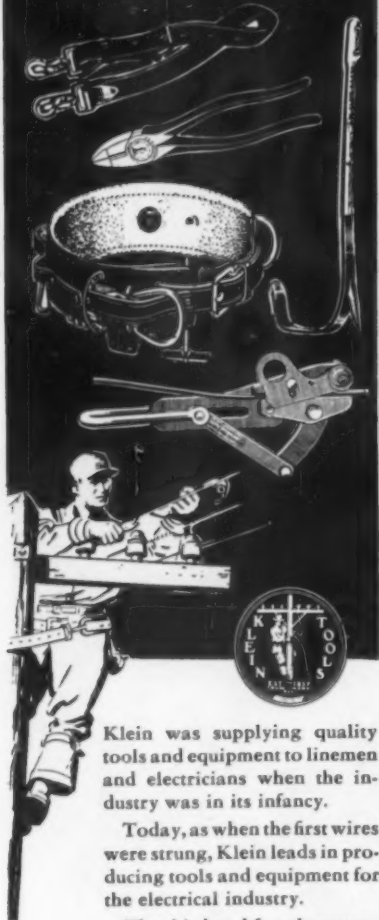
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Bonding Bus Duct Housing

Q. Has any method been suggested or contemplated by the Code Panel for the positive bonding of the bus duct housing where the runs are long?

The method now used depends entirely on the bolts that connect the casing.

I understand that there have been many failures in various parts of the country because of this lack of bonding.—L.L.D.

A. No. It would seem that with proper make-up of each section of the bus duct the integrity of the grounding system would be assured. The failures you may have heard of may have been those not resulting from poor bonding, but rather from the phenomena of static build-up on the busway systems.

The fine-print note at the end of Article 364 does offer a solution to this problem.—B.Z.S.—4/59/10

Grounding Stationary Motor Frames

Q. Section 4436-a states that frames of stationary motors shall be grounded if supplied by means of metal clad wiring. Isn't the metal sufficient for a ground and is this directed specifically to armored type cables and cables enclosed in conduit? Section 4436-a wording implies that the metal enclosure adequately serves as a grounding conductor. I have been employing the metal enclosure or conduit as a motor frame ground in all stationary motor installations without the usual frame ground as indicated in Section 4436-a. Am I right in doing this? I am basing my opinion on Section 2557 of the NEC—K.W.L.Y.

A. For the benefit of our readers, the provisions of Section 4436 read as follows:

"Grounding. Stationary Motors. The frames of stationary motors shall be grounded if any of the following conditions exist:

- a—If supplied by means of metal-clad wiring.
- b—If located in a wet place and not isolated or guarded.
- c—If in a hazardous location. (See Article 500)
- d—If the motor operates with any terminal at more than 150 volts to ground.

"Grounding of the metal frame is

preferable, but if the frame of the motor is not grounded, it shall be permanently and effectively insulated from ground."

It is important to note that the provisions of Section 4439 refers us to Article 250 with respect to the method of grounding, and this section further requires a junction box to be installed integral with the motor frame, or within 6 ft of same so that we have a continuous metallic grounding circuit when the motor is served through armored cable or metal raceways.

As you say, the provisions of Section 2557 cover the method of grounding fixed equipment, and when such equipment is metallically connected to grounded cable armor or metal raceway, it is considered to be grounded by such a connection.

It appears to me that the above code provisions prohibit a method of procedure which was followed many years ago, when rigid conduit, serving a motor terminated in a fitting, such as a Condulet, near the motor terminal; and exposed splices were used to connect the branch circuit conductors to the motor frame, presenting a personal injury hazard.

It is also significant to note that the provisions of Section 5026-b, 5066-b and 5087 require a bonding jumper to be installed around the flexible conduit serving a motor located in any hazardous location.

In view of the foregoing, a motor frame is considered to be grounded when metallically connected to grounded cable or metallic raceway, since such wiring methods serve a dual role of enclosing the conductors and acting as a grounding conductor.—B.A.McD.—4/59/11

Panelboard Barriers

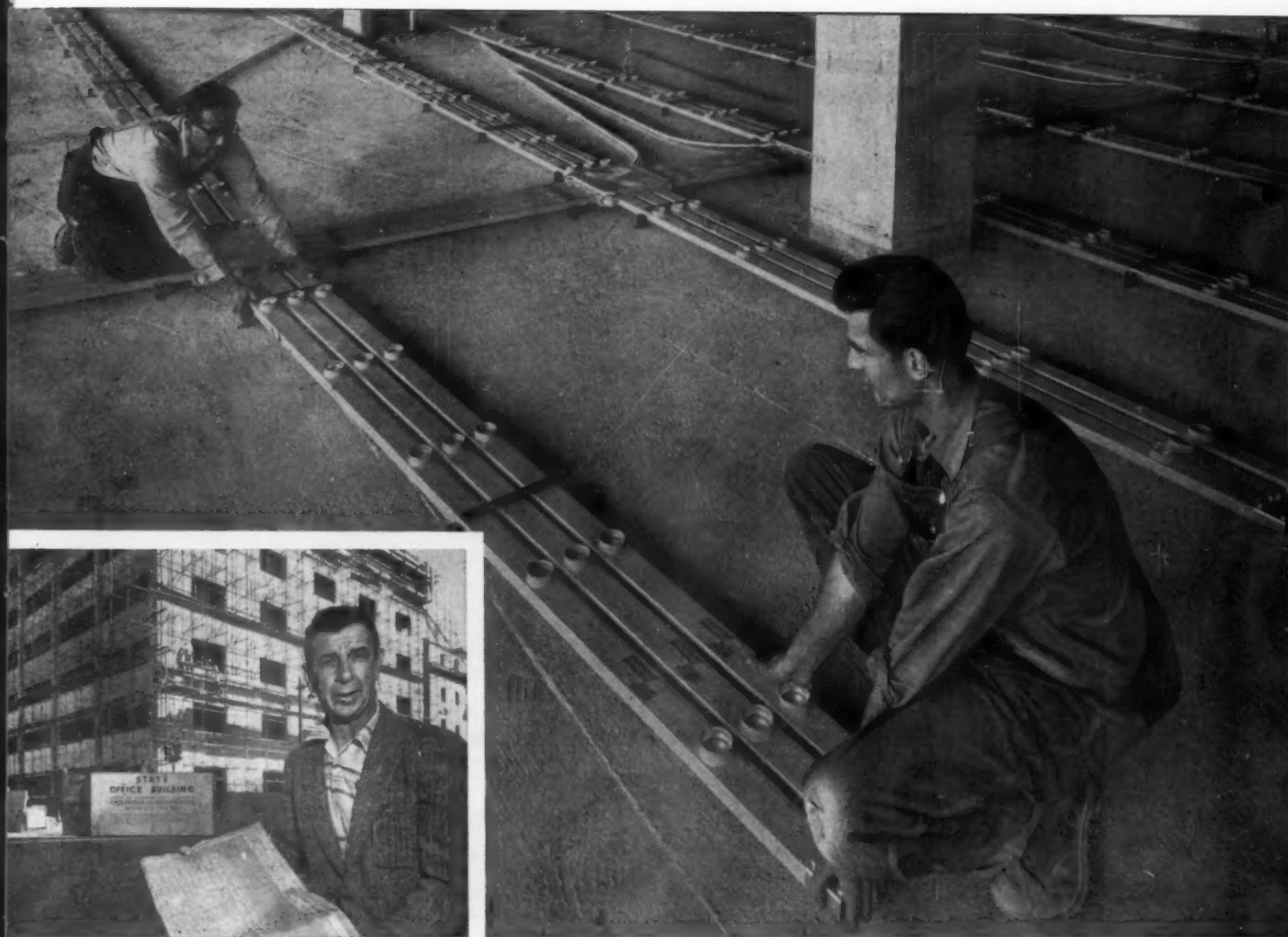
Q. We are making a residence panel which we call a "Housepower Panel."

Two busses are used. A 2-wire single phase bus, 120/240 volts in the upper half of the panel and a 3-phase 220-volt bus in the lower half.

Does the code require a barrier between the upper and the lower sections of the bus?—R.E.L.S.

A. In my opinion a barrier is not required.

Section 3011 (new Section 300-2) permits light and power conductors in the same enclosure as long as both systems are rated at 600 volts or less.—B.Z.S.—4/59/12



Mr. Reave E. Teague, Project Supervisor for Patterson-Emerson-Cornstock, Inc., reports, "We like SPANG Underfloor Duct because all component parts fit together with a minimum of effort. SPANG has obtained maximum flexibility in their Underfloor Duct System with the fewest possible parts."

SPANG Underfloor Duct provides outlets every 24 inches in this system. Ducts carry electrical, telephone and intercom wiring. Future changes to meet tomorrow's needs can be quickly and easily handled without extensive reconstruction.

SPANG Underfloor Duct provides flexible wiring system for State Office Building in San Francisco

San Francisco's new State Office Building has a wiring system that meets all of today's power, telephone and internal communication needs . . . and will be able to meet any future requirements, too . . . without expensive or extensive changes.

That's because SPANG Underfloor Duct has been installed throughout this seven-story, 400,000 square-foot building.

ADAPTABLE FOR FUTURE NEEDS

A triple-duct system, with outlets every 24 inches, was laid at five-foot intervals across the floor and is interconnected with junction boxes at approximately every 50 feet.

Partitions, desks, furniture and phones can be arranged to suit present requirements. Any future re-arrangement of office space can be easily handled by closing up present outlets and tapping into new ones. Additional wiring can be added at any time.

Architect: California State Division of Architecture, Dept. of Public Works
General Contractor: Barrett Construction Company, San Francisco
Electrical Contractor: Patterson-Emerson-Cornstock, Inc., San Francisco

EASY INSTALLATION

Careful manufacturing of component parts means fast assembly of the ductwork, helping to keep costs down. The exclusive SPANG aluminum junction box is internally arranged to prevent any possibility of costly construction errors.

WRITE FOR COMPLETE INFORMATION

Find out how SPANG Underfloor Duct can help you design continually-modern wiring systems. Mail the coupon below.

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ECM-1

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The Republic ELECTRUNITE E.M.T. installation photos, above, were taken during the construction of this attractive six-story resident students apartment building on the campus of a leading Midwest university.

Architect: Burnham & Hammond, Chicago, Illinois

General Contractor: B. W. Handler Construction Co., Chicago, Illinois

Electrical Contractor: Gibson Electric Company, Inc., Chicago, Illinois



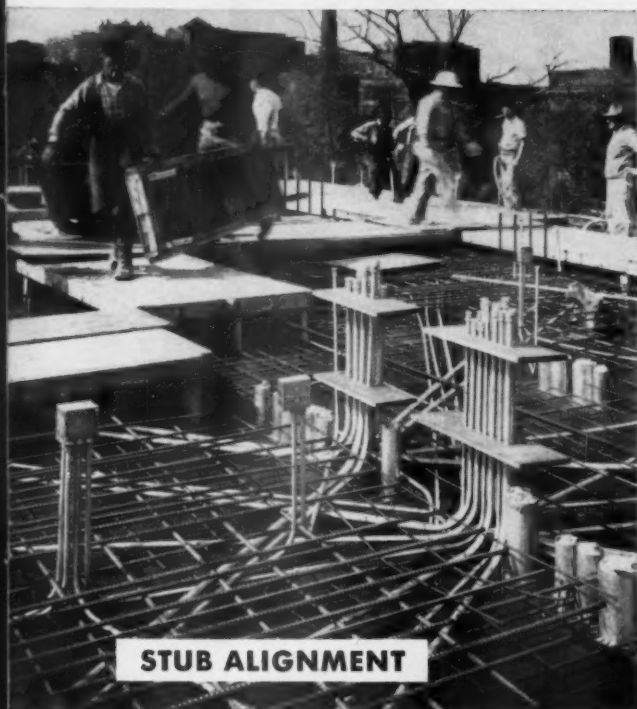
EXCLUSIVE "INCH-MARKS" make quick measurement a cinch. Every length of Republic ELECTRUNITE E.M.T. is marked off in feet and inches from end to end. Eliminates guesswork, saves time, saves material, keeps the job on schedule.



"GUIDE-LINE" extends full length of tubing. By properly aligning with calibrations on Republic Bending Tool, bends are kept in the correct plane. It is easy to make true offsets, saddles, back-to-back bends to meet the job.

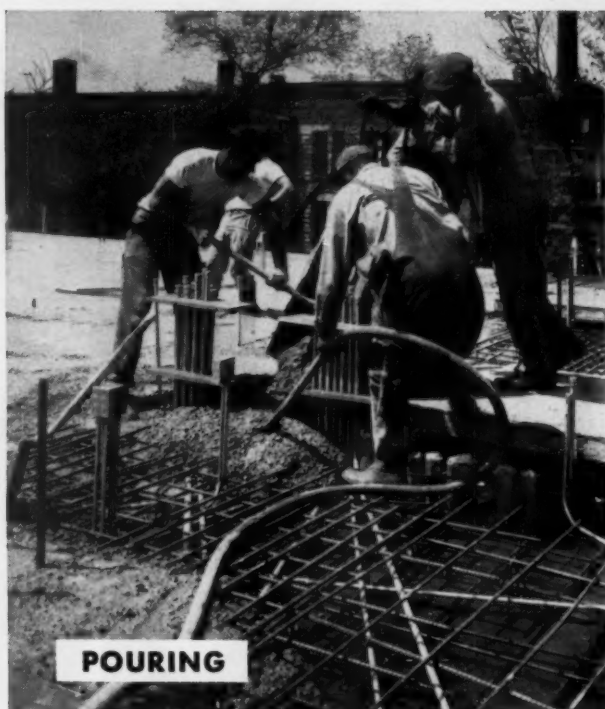


New, Improved **"INSIDE-KNURLING"** with exclusive **SILVERSLICK** inside finish makes wire pulling up to 37% easier. Wire pushing is easier, too. Wires slip through longer runs and greater bends easier than ever before.



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... "INCH-MARKS" and "GUIDE-LINES" help make neat, compact stub groupings.



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In concrete installations...quality materials, craftsmanship, and good installation practices assure a good job. Republic ELECTRUNITE® E.M.T. with exclusive "INCH-MARKS", full length "GUIDE-LINES", and new, improved "INSIDE-KNURLING" with SILVERSLICK inside finish are three good reasons that prove... the best costs less installed! Here's why:

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Republic ELECTRUNITE E.M.T. is produced to ASA Specifications C80.3, Federal Specifications WW-T-806, and carries the Underwriters' Seal of Inspection. For additional information, send coupon today.

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Okonex-Okoprene 15kv primary distribution cables solve Magnolia Petroleum Company's space problem and climate problem (wet and salty atmosphere) and provide greater safety in its Beaumont refinery.

Magnolia Refinery improves voltage regulation, beats humidity with Okonex-Okoprene cables

The giant 1,500-acre Magnolia Petroleum Company refinery, located on the broad Gulf Coast Plain, generates and uses 900,000 kilowatt hours a day, more than its neighboring city of Beaumont, Texas. A cable breakdown here could cause costly damage to equipment and the material in process (more than 400 oil products are manufactured). The entire cable system must serve Magnolia's round-the-clock operation without interruption in the face of the high moisture-saline content of the air, plus the chemicals and

intense heat used at many of the processing units.

For the 15kv primary aerial loop distribution system, Magnolia's engineers selected shielded Okonex-Okoprene cables. These butyl-base insulated, neoprene-sheathed constructions saved space, eliminated safety problems and provided improved voltage regulation far superior to previous open wire constructions and other insulated cable constructions studied. In addition, their excellent moisture, heat and corrosion resistance were important

assurances of maximum service life.

Okonex-Okoprene, in 3,000 to 15,000 volt constructions, was also used for trunk feeders to and from substations, tie lines and motor leads installed both aerially and underground.

To help you specify the optimum cable for your important power and control cable needs, contact your Okonite representative or write for the free Bulletin EC-1117, "How to choose insulated cable," to The Okonite Company, Passaic, New Jersey.



where there's electrical power . . . there's **OKONITE CABLE**

In the News

\$15 Million Promotion to Back Wiring in '59

Record multimillion dollar national and local sales campaigns will back residential and commercial wiring activity through the year. Representatives of the electrical industry, meeting in New Orleans for the 15th Annual National Wiring Sales Conference, were briefed on the several promotion programs during conference sessions on February 26-27.

The conference sessions, many of which will be the basis for local residential and commercial wiring promotions, included a dramatic presentation of the 1959 residential wiring sales "line." From this multimillion dollar line will hang such national and local promotions as Housepower, Medallion Home, Light for Living, and other allied sales promotions to help sell more wiring in the home so the consumer can "Live Better Electrically". The presentation was made by J. Roscoe Furber, chairman of the Edison Electric Institute Housepower Committee and general sales manager, Northern States Power Company, Minneapolis, Minnesota; Robert E. Ingmire, of the Live Better Electrically Project, New York; and Andrew Doremus, chairman of the National Wiring Bureau's Plan Committee, and advertising manager, Construction Materials Sales, General Electric Company, Bridgeport, Connecticut.

Housepower, the program which during the past two and one half years has resulted in rewiring thousands of houses, will continue to educate home owners on the need for more and better wiring. This national advertising program is flexible enough for local tie-in promotions; inter-industry support through advertising will be provided at all levels, and Edison Electric Institute and the National Wiring Bureau are supplying materials for local tie-in use.

In addition, as a means of stimulating electrical modernization in some 20 million existing dwellings which have substandard wiring, the Medallion Home concept, previously a new home promotion, will be channeled into the modernization field.

It is estimated that, altogether, the 1959 coordinated program of the electrical industry in the resi-

dential wiring field will amount to about 14 or 15 million dollars in advertising promotion. Edison Electric Institute will spend about \$2½ million; Live Better Electrically about \$1 million; Westinghouse about \$2½ million; and individual manufacturers such as General Electric and Frigidaire will probably spend an additional several million dollars for advertising and television shows.

Presenting the National Wiring Bureau's 1959 national program for promoting commercial wiring modernization, electrical contractor Sydney Blumenthal, of Blumenthal-Kahn, Baltimore, Md., and chairman of the Commercial Task Group of the Bureau, gave conferees a look at some brand new promotion materials. A new consumer idea book entitled "The Big Difference Is Planned Profit Power" is the result of a year's effort in carefully compiling data on the commercial wiring modernization market. The brochure outlines ways in which electricity is helping owners in all kinds of business to increase sales and profits. The new book is intended to be used by utility and manufacturer representatives, contractors, and distributors.

Loads of Tomorrow

A look into future developments and applications of electricity was revealed by J. H. Fooks, director of engineering, Consumer Products, Westinghouse Electric Corporation, Pittsburgh, Pa. Looking ahead 10 and 20 years, Mr. Fooks predicted the construction of "total electric homes". This was the goal, he said, of Westinghouse in order to maintain the historical rate of growth in the residential area. "I do not mean," he said, "homes with merely a fair number of appliances, but rather homes in which everything will be run by electricity, and where electricity will take the place of fuel." Such a home would require a 200-amp entrance with at least six 240-volt circuits (30-amp capacity) to serve the major appliances, including not only cooling, but complete house heating. The average home today, he said, uses about 3,300 kwh per year. An average

"total electric home" will use 8 to 10 times that much or between 25,000 and 30,000 kwh every year. Westinghouse, he said, is backing this program with a budget of \$2½ million over the next two years.

Maintaining that "It's Good Business" for the electrical distributor to promote adequate wiring and Housepower, Thomas F. Preston, public relations manager for the National Association of Electrical Distributors, said that the distributor is the strongest coordinating link in the entire wiring and Housepower program.

H. H. Watson, commercial engineer of the General Electric Company, Bridgeport, Conn., told conferees that sound engineering principles had become the basis for standard wiring practice and the new electrical standards of the FHA and the National Electrical Code.

Mr. Watson, a member of the Industry Committee on Interior Wiring Design and a member of the National Electrical Code Correlating Committee, discussed the new Federal Housing Administration's Minimum Property Standards and the new National Electrical Code and how the improved standards, which will closely parallel those of



PROPOSERS of complete electrical living are contractor (L to R) E. M. Lothrop, Huron, S. D.; John Cornelius and Harry Medberry, M&M Electric, Rock Rapids, Iowa. Trio met at recent electrical conference in Minneapolis.

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When you use a voltage tester, you literally have your life in your hands. So when you buy a voltage tester... think of safety first. Demand all this protection:

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the National Wiring Bureau, would affect wiring promotion.

The electrical section of the FHA Minimum Property Standards represents a minimum of interior wiring for residences to assure that within the 20 to 30 years for which a mortgage loan is insured, the security for that loan will remain a marketable property.

Mr. Watson noted that under the new standards, FHA had gone to 100-amp service, increased lighting and receptacle requirements and a substantial increase in branch circuit capacity. He also noted that the new National Electrical Code (which is sponsored by the National Fire Protection Assoc.) will require 100-amp service, and have increased circuit requirements.

Thinking, however, in terms of future loads such as for heating

and cooling, Mr. Watson suggested that wiring for such substantial loads needs the industry's attention. While the standards have been improved, he said, there are "still 25 million or more houses in the U. S. that are significantly substandard in wiring", revealing a need for wiring promotion.

LOOK Magazine awarded its "Oscars" for residential wiring promotion for the fifth consecutive year. Robert C. Marshall, Ltd., Washington, D.C., won the award for electrical contractors. Baltimore Gas & Electric Company won the award in the category of utilities with over 250,000 meters, and Kentucky Utilities Corporation in the category of under 250,000 meters. Farrell-Argast Electrical Company, Indianapolis, received the award for distributors.

Electric Heating Sparks Upper Midwest Conference

For a geographical area with from 7,000 to 11,000 degree days and design temperature differences from 80 degrees to 105 degrees, an encouraging enthusiasm and interest in electric home heating was evidenced at the 22nd Annual Upper Midwest Electrical Industry Convention held at Minneapolis' Hotel Leamington, February 22-25. Electric heat sessions were an important part of the agenda of all participating groups—electrical contractors, utilities, co-operatives, inspectors, manufacturers and distributors, and architects and engineers. Again the convention, with total registration of some 1700, was organized and coordinated

through the North Central Electrical League.

More than 340 electrical contractors from Minnesota, Wisconsin, North and South Dakota and Iowa spent post-session hours seeking answers to pertinent questions at a special exhibit of some 22 manufacturers of house insulation and home electric heating equipment. More than 200 copies of the League's recently published Upper Midwest Electric Home Heating Manual were sold at the show.

Legislation Problems

For out-of-state contractors, the 31st Annual Meeting of the Min-




NEW OFFICERS of the Minnesota Electrical Association elected at 31st Annual Meeting are: (L to R) secretary—Robert DeWar, Fairmont; treasurer—S. J. Berquist, Litchfield; president—Gene Burton, Brainerd; and vice president—Bert Gordon, Albert Lea.



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INTEREST IN electric home heating brought (L to R) Ralph Ruben, L. E. Haeuser, and W. L. Roettiger, all of H & F Roettiger, Inc., Fountain City, Wis., electrical contracting firm to heating session and exhibit at Upper Midwest Electrical Convention in Minneapolis.

Minnesota Electrical Association was a highly informative session. This group of more than 200 electrical contractor-dealers throughout Minnesota is now battling a proposed revision of the State Electrical Licensing Law and composition and administration of the State Board of Electricity. A bill of this type, now in the legislature would, among other things, establish an Electrical Appliance Installers License to permit an applicant with a year's experience (on his own say-so) to do such "relatively simple work" as installing circuits for electric ranges, water heaters and dryers. Such a proposal is backed by Minnesota cooperative power suppliers, municipal utilities and retail dealers associations reportedly to provide improved and more economical service to farmers and home customers.

MEA's position, and that of NECA groups, electrical inspectors and the State Board of Electricity, is that the focal points of safety and adequacy are overloaded circuits, feeders, distribution panels and services and these would be of no concern to appliance installer licensees. Under present strict licensing and inspection regulations, Minnesota has the lowest electrical fire record (0.18 fires per 1000 population—1957) of any state reporting such information. There is no need for revising present regulations, they contend.

Contractors in the meeting were also warned that another bill in the legislative hopper, designed to control heating and air conditioning

installations, might take electric home heating and even room air conditioning installations away from the electrical contractor. They were also cautioned to keep abreast of increased taxes, increased unemployment compensation and similar items so they will be prepared to increase "cost of doing business" items in their bidding to cover themselves.

MEA Manual

Highlight of the MEA meeting was the presentation of the association's Estimating-Accounting Manual for Electrical Contractor-Dealers. Hot off the presses, this 14-ring, hinged-cover, visual indexed, loose-leaf volume is the result of five years of research, revision and expansion of a manual first issued in 1939. It represents more than 20 years of business and estimating experience of member contractors; incorporates the assistance of the University of Minnesota Extension Division and a former U. of M. School of Business instructor; was whipped into final shape by such contractor stalwarts as association founder-member Wm. A. Ritt of St. Peter, Elroy Lehn of Anoka and Norman DeYoung, now with the construction department of Minnesota Mining and Manufacturing Co., St. Paul.

Designed and published especially for small and average electrical contractors, this volume is available on a lease basis from the Association. Initial lease fee is \$35



LOWELL MAST, director of engineering, Electromode Corp., Rochester, N. Y., tells Minnesota electrical contractors that economical electric home heating depends upon good insulation; reveals that electric heating and insulation manufacturers are cooperating to lower installed capacity and operating costs.

Progress Is Our Most Important Product

GENERAL  ELECTRIC



CHANCE?

"Make a wrong buy and the boys upstairs are the first to know. Might as well make everybody happy. Me included. Take these General Electric Lamps, now. Odds are 999 out of 1,000 in my favor that they'll light right from the start. And 99 out of 100 will *stay* lit for almost two full years. Cost less than G-E Fluorescent Lamps I bought in 1950, too. How can I lose?"

CHANCE? "Why take chances when an average of 99 out of 100 G-E Lamps I buy now will still be burning in 1961!"

General Electric Co., Large Lamp Dept. C-908, Nela Park, Cleveland 12, O.

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AUTH Clock Systems feature Telechron-motored, self-starting synchronous movements. They operate directly on ever-accurate alternating current supplied by the central power station, without the use of master clocks, relays, rectifiers or other auxiliary devices.

When current fails all clocks are collectively restored to correct time either manually or automatically. By adding a program instrument and audible signals AUTH Clock Systems provide a simple and flexible method of programming activities of large groups in schools, industrial plants, etc. Simplicity is the keynote . . . with AUTH Clock Systems.



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Please send booklet on AUTH Centrally Controlled Clock and Program Systems.

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HAPPY MOMENT arrives for Norman DeYoung, Wm. A. Ritt, and Elroy Lehn with presentation of first copies of Minnesota Electric Association's Estimating-Accounting Manual at recent Minneapolis convention. Trio spent hundreds of hours developing and editing material in book.

(membership application fee for non-members) with an annual renewal fee of \$12.50 to cover cost of new pages and periodic revisions of material.

In the interest of upgrading electrical wiring and workmanship in the state, the association is at present financing a \$400 per year scholarship for electrical education at the Dunwoody Industrial Institute in Minneapolis and hopes to add similar scholarships later.

Electric Heating

Existing residential electric heating installations in the Upper Midwest definitely have proved this type of heating as economically feasible for the average home owner. And a convention announcement of new electric heat rates by three utilities serving Minnesota, North and South Dakota sharpened the interest of registrants. They are Northern States Power Co., Minneapolis; Minnesota Power & Light Co., Duluth; and Otter Tail Power Co., Fergus Falls. Northern States Power, for example, has a new rate of 1.75 cents per kwhr for all energy over 500 kwhrs per month if no other fuel system is used for heating the home.

Capacity audiences at the heating sessions learned that good insulation in existing and new homes is the key to efficient electrical residential heating; that insulation and electric heating manufacturers are working as a team to reduce installed capacity and operating costs; that electric home heating definitely is on the move.

Among the vast array of interesting facts revealed at the sessions were:

A good home insulation job will pay for itself in about three years.

Vapor barriers must be used with insulation for electric heating.

A well insulated 1,000-sq-ft living area home can be electrically heated in this area (from September to June) for an annual cost of a little more than \$200.

Electric home heating can be installed for about \$400 less than a conventional fuel system. (Elimination of chimney, furnace and duct spaces a big factor.)

Vent fans should be placed in kitchen and bathrooms.

Two-stage thermostatic control provides greater diversification and operating economies. A good heating system is one you are unaware of—and electric heating meets that requirement.

Electric heating installations must be carefully engineered, using procedures outlined in (for this area) the Upper Midwest Electric Home Heating Manual.

Speakers at the heating sessions included: Lowell Mast, Electromode Corp., Rochester, N. Y.; J. D. Spencer and G. A. Erickson, Wood Conversion Co., St. Paul; Roy Black, Owens-Corning Fiberglass Corp., Minneapolis; S. B. Aronson, Berko Electric Mfg. Corp., Queens Village, N. Y.; Jack Struchen, Volco Company, Minneapolis; C. P. Wagner, North Central Electrical League, Minneapolis.

Code Session

The annual all-industry wiring code meeting, sponsored by the



ELECTRIC HEATING for apartment units is the subject of this Upper Midwest Electrical Convention pre-session huddle between Minneapolis builder (left) H. S. Genung, Cornucopia Properties, Inc.; and Dewey M. Wallin, president of Northside Electric Co. and the Minneapolis Chapter, NECA.

NOW KAISER ALUMINUM RIGID CONDUIT COSTS ARE COMPETITIVE WITH STEEL

Now, the delivered price of Kaiser Aluminum rigid conduit is either equal to that of steel—or within 3% of it! And that's not all . . .

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WEIGHT COMPARISON, ALUMINUM VS. STEEL

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Trade Size, Inches	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6
ALUMINUM	27.4	36.4	53.0	69.6	86.2	115.7	182.5	238.9	287.7	340.0	465.4	612.9
STEEL	79.0	105.0	153.0	201.0	249.0	334.0	527.0	690.0	831.0	982.0	1334.0	1771.0

Aluminum conduit weighs only *one-third* as much as steel conduit! Result: easier handling . . . less worker fatigue . . . faster installation . . . fewer conduit supports required.

You save on maintenance costs. Aluminum conduit can't rust, resists corrosion, never needs painting . . . lasts longer with minimum replacement.

Aluminum conduit is nonmagnetic which reduces the voltage drop. And it's non-sparking for completely safe use in hazardous explosive atmospheres.

All of these extra advantages spell *savings* . . . savings when you buy, savings when you build, and savings in the years to come. Can you afford *not* to find out more about Kaiser Aluminum rigid conduit?

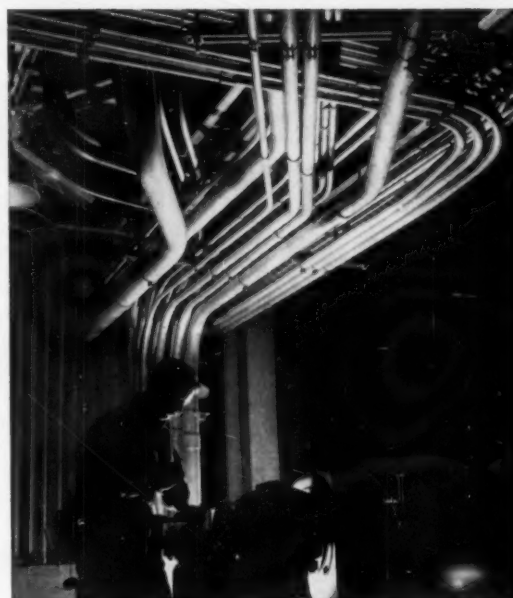
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We'll be glad to send you a complete run-down on the advantages of using aluminum conduit—comparative conduit weights, comparative labor cost charts, installation details, and much more valuable information.

Get all the facts about Kaiser Aluminum rigid conduit and how it can save you money. Mail the coupon now!



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the right wire and cable
for your job?

**MEET
THE
MAN**
WHO CAN HELP YOU
... on page 194



Minnesota Chapter, International Association of Electrical Inspectors, was chairmanned by Chapter president Ed Turner of Minneapolis. Panel members answering written and floor questions from a packed house included: H. H. Watson, G. E. Co., Bridgeport, Conn.; contractor Richard Osborne, St. Louis, Mo., member of the NECA Codes and Standards Committee; S. Martin Streed, chief electrical inspector, Minneapolis; S. M. Sanford, executive secretary, Minnesota State Board of Electricity; George Yineman, chief electrical inspector, State of North Dakota; and Norman DeYoung, representing the Minnesota Electrical Association.

Rural Electric Development

At a session sponsored by the Minnesota Farm Electric Research Council, cooperative power suppliers were warned that past sales policies have discouraged full farm electrification. Virgil Herriott, manager, Sioux Valley Empire Electric Association, Coleman, S. D., urged overhauling present regulations limiting size and type of electrical equipment for farm installations. "Agriculture depends upon large quantities of power and we haven't even scratched the surface of rural electrification," he stated, adding that his organization has set a sales target of an average of 30,000 kwhrs per farm annually for the next few years. Plans to accelerate farm load growth include bringing 3-phase service to farm customers. About 30% of the homes in his area can be expected to use electric heat in the near future, he noted.

Peak demands with electric house heating on the lines of the Freeborn-Mower Cooperative Light & Power Association, Albert Lea, Minn., occur between 7 a.m. and 8 a.m., noted Co-op official Arvid Waller. Demand meters on test homes indicated this morning peak to be 25% higher than the evening peak. Although Waller's group has no special electric heating rate and is approaching home heating with caution, their lines already have 25 complete electrically heated homes and more than that number with supplementary electric heat, he revealed.

Other Sessions

Registrants attending the all-industry luncheon were treated to a preview of Edison Electric Insti-

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Mounts Minerallac hangers No. 9 to No. 6 on I-beams safely without necessity of drilling holes. Made of heavy gauge zinc plated steel with deep drawn ribs to give needed strength, these durable, light weight beam clamps have 3/4-28 tapped holes—will fit beam flanges up to 1/2 inch thick. Furnished with case-hardened set screw. Low cost.

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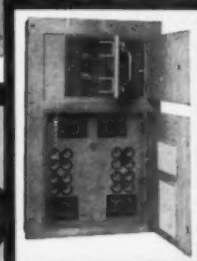
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Shown above are 3-ft.-diameter domed diffusers of white translucent PLEXIGLAS, at conference room of Cluett, Peabody & Company, Inc., New York City. Interior design by Designs For Business, Inc., New York.

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NORTH DAKOTANS at recent Upper Midwest Electrical Industry Convention in Minneapolis included; (L to R) B. H. Barnard, secretary of North Dakota Electrical Contractors Association, Wahpeton; George A. Yineman, Ace Electric Co., Minot; George C. Hilstad, North Dakota State Electrical Board, Mayville; and Wesley Severson, Electrical Builders Associates, Valley City, N. D.

tute's \$2.5 million promotion of National Electrical Living. W. D. Cummmingham, vice president, Fuller & Smith & Ross, Inc., New York gave the first area presentation for electrical industry members of the giant three-pointed program: Medallion Home to sell more appliances; Housepower to sell more wiring capacity for existing and new homes; Lighting for Living to sell more and better lighting in all homes.

While this national promotion will create an all-electric climate through TV and consumer magazine advertising, its real purpose is to aid and support aggressive local programs. He urged all present to take full advantage of this national effort in timing and establishing their own promotions.

What's new in the lighting field? More efficient light sources, longer lamp life, higher footcandle intensities, the Blackwell report, more critical means of evaluating light output, glare and comfort, high frequency systems, new fixture concepts and a host of other developments were revealed at the Lighting Progress Report session sponsored by the Twin City Section, Illuminating Engineering Society. In presenting this report, Elton A. Lindsay, supervisor of industrial lighting applications for General Electric's Large Lamp Department, established the goal of the lighting industry and lighting engineer as that of bringing indoors the kind of lighting we need with comfortable levels commensurate with those found outdoors. Today, light-

ing systems are designed in units of 100 fc instead of the 10 fc of yesteryear, he noted.

MEA Officers

At its business session, the Minnesota Electrical Association (out-of-state electrical contractors) elected the following officers: president—Gene Burton, Brainerd; vice president—Bert Gordon, Albert Lea; secretary—Robert DeWar, Fairmont; treasurer—S. J. Berquist, Litchfield. Harry W. Kane, Minneapolis, is the association manager.

Elected to represent the various districts on the MEA Board of Directors were: past-president Milo A. Miller, Blue Earth, Advisory Director at Large; Wm. A. Ritt, St. Peter, Permanent Director at Large; (Dist. 1) Oliver Larson, Faribault, and Frank Adair, Rochester; (Dist. 2) Louis Kasperek, Le Sueur, and J. A. Hiebert, Windom; (Dist. 3) N. G. Miller, Benson, and W. P. Haworth, Worthington; (Dist. 4) Julius Holt, Almora, and Gerhart Linser, Alexandria; (Dist. 5) Al Saenger, St. Cloud, and M. J. Bischoff, St. Cloud; (Dist. 6) Earl Odmark, Cambridge, and Allen Killmer, Osseo; (Dist. 7) Paul Kuzel, Pine City, and Earl Paulson, Staples; (Dist. 8)—to be elected later; (Dist. 9) L. W. Best, Thief River Falls, and Joseph Lee, Mahanomen.

Electrical Trade Show in Washington

The Electrical Institute of Washington, D. C., and the Electrical Manufacturers Representatives Association of Baltimore (Maryland) held its second Biennial Electrical Trade Conference and Exposition at the Sheraton Park Hotel, in Washington, D. C. on February 17-19. Featured in this three-day event were product exhibits of over 100 manufacturers and a series of conference sessions on various electrical industry topics. Over 5000 visitors, consisting of architects, consulting engineers, plant engineers, electrical contractors, electrical distributors and salesmen, government engineers and specifiers of electrical equipment, and others registered for the show.

Each of the three days opened with a luncheon and a nationally known speaker and was followed by a conference session. Exhibits opened daily at 1:30 p.m. and remained open until 9:30 p.m.

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First day's luncheon speaker was F. H. Robey, executive vice president of Federal Pacific Electric Co., and vice president of NEMA and American Standards Association, who discussed "How NEMA Standards Apply to You". Mr. Robey set the pace for his talk by describing the many standards we live with and use in everyday life, and the chaos we would all face without these standards. He then related these standards and the resulting benefits to the products of the electrical manufacturing industry, and the need, from the standard of economy, safety, and flexibility for standards in electrical products.

The afternoon conference session consisted of a panel discussion of NEMA Standards, moderated by Calder C. Downie, of Douty & Downie, manufacturers' representatives of Baltimore, and five panelists. Each panelist spoke briefly on standards relating to a specific field of products, and the audience participated through a question and answer period following each speaker.

The speaker for the second day luncheon period was Dr. Samuel G. Hibben, lighting consultant of Montclair, N. J., past-president of the Illuminating Engineering Society, and formerly commercial manager of the Westinghouse Lamp Division, Bloomfield, N. J., who addressed the group on the subject of "Future Lighting in Space". Dr. Hibben's talk was provocative, well illustrated with color slides, and involved the discussion of new references which will be required in lighting practices in the Space Age ahead.

The conference session for the second day was chairmanned by Harold V. Oerting, lighting engineer with Potomac Electric Power Co., Washington, and was devoted to two important subjects in the field of lighting.

The first conference subject was "High Frequency Lighting", which was presented by Q. D. Dobras, application engineer, General Electric Co., Nela Park. Mr. Dobras reviewed the existing types of power converters—static frequency multipliers, motor-generator set converters, and transistorized converters—and gave the advantages and disadvantages of each type.

The second subject for the lighting conference was the "New Order of Footcandles—Its Effect on the Lighting Industry," which was presented by Richard G. Slauer, sales manager of Lighting Division, Sylvania Electric Products Inc., Wheeling, W. Va., and

vice president of the Illuminating Engineering Society. Mr. Slauer described how the new IES Footcandle Recommendations were arrived at based on the light and vision research of Dr. Richard C. Blackwell, of the University of Michigan, and discussed some of the problems which will be encountered in applying these new lighting levels in the home, and in commerce and industry. These new lighting levels offer a challenge and an opportunity to the lighting industry, he said, and the need to stress lighting quality more than ever before. The new footcandle levels represent minimum standards based on current knowledge of lighting application practice. One of the major pitfalls in applying higher lighting levels may be heat, he said, as 500 footcandles will require on the order of 15 watts per square foot based on existing light sources. Such problems may require the use of combinations of general uniform lighting plus localized lighting, he indicated, which would be a reversal of recent practices and thinking.

Luncheon speaker for the final day of the Exposition was H. L. Cramer, manager, Agency & Construction, Sales Dept., Westinghouse Electric Corp., Pittsburgh, who discussed "Commercial and Industrial Electrical Construction". In his color slide presentation, Mr. Cramer took a look ahead over the next ten-year period and predicted an electrical modernization market of \$108 billion.

The last conference session was devoted to a symposium on "Industry's Wiring and Lighting Programs in 1959". Moderator for the symposium was Lester E. Barrett, chairman of National Wiring Bureau, and president of Barrett Electrical Supply Co., St. Louis.

Edison Electric Institute's new National Electrical Living Program (EC&M, Jan., 1959, pp. 162-164) was presented by Frank Kitzmiller, Jr., EEI, New York City.

The National Wiring Bureau's new Commercial Wiring Program (EC&M, Feb., 1959, pp. 264-265) was outlined by George B. Roscoe, National Electrical Contractors Association, Washington, D. C.

The National Lighting Bureau's "Eye-Fi" Program (EC&M, Jan. 1959, pp. 160-161) was described by Laurance C. Messick, manager of National Lighting Bureau, New York City.

The National Wiring Bureau's Residential Program was outlined by John F. Biggi, National Wiring Bureau, New York City.



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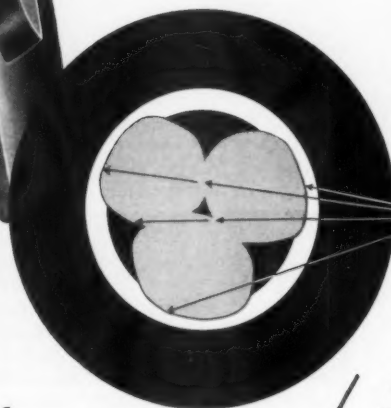
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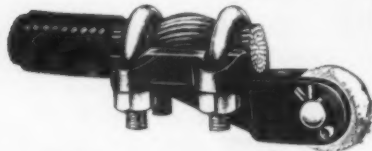
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CODE EXPERT George Andrae, Herman Andrae Electric Co., Milwaukee, returns to his alma mater—the University of Wisconsin—to advise contractors attending electrical estimating course on proposed changes to National Electrical Code and recommend adoption of same in Wisconsin State Electrical Code.

100 Attend U of W Estimating Course

A new high in attendance for the University of Wisconsin electrical estimating course was established when 100 electrical contractors, engineers, estimators and construction superintendents from Wisconsin and five adjoining states journeyed to Madison Feb 26 for a 2-day review of techniques and procedures. Classes were held in the new Wisconsin Center building designed for this type of adult educational forum.

The short course, planned and held by the University Extension Division in cooperation with the College of Engineering, drew its "faculty" from experienced personnel in the electrical construction field. Staff members included: Ray Ashley, electrical engineer and consultant, Oak Park, Ill.; John J. McLaughlin, vice president, Kelso-Burnett Electric Co., Chicago; George Andrae, president, Herman Andrae Electric Co., Milwaukee; Elroy A. Lehn, president, Lehn Electric Co., Anoka, Minn.; Robert J. Nickles, Jr., president, Robert J. Nickles, Inc., Madison; Wm. D. Plummer, vice president, H and H Electric Co., Inc., Madison; August Eckel, associate editor, *Electrical Construction and Maintenance*, Chicago; and R. L. Boyd, manager, electric heating division, Edwin L. Wiegand Company, Pittsburgh.

Course agenda covered the broad scope of figuring electrical con-

struction projects from a pre-estimating evaluation of prospects of getting the job through the mechanics of estimating and selling the job. Also included were techniques of establishing effective job cost control, methods of calculating electric space heating requirements, new electrical code regulations affecting installations, and the inherent advantages of keeping abreast of current industry developments and advances through regular study of relevant trade publications.

Lively panel and floor discussions following the subject presentations gave registrants an opportunity to evaluate their own specific operations with those of fellow "students"; added an air of comfortable informality that generated a healthy exchange of ideas and experiences. Throughout the course, contractors were seen taking copious notes for future reference. One estimator made certain he didn't miss a word. He "taped" the entire session on a tape recorder for play-back and transcription at his leisure.

Contractor consensus, reflected by unsigned evaluation sheets, was that this 2-day session more than justified the time they took from their respective businesses. Interest and attendance at the sessions has led Institute Coordinator Robert L. Loetscher of U of W to speculate that this course might easily become an annual affair with future curricula expanded to encompass additional segments of the overall electrical construction operation.



LESSON in calculating residential electrical heating requirements is given contractor "students" at University of Wisconsin Electrical Estimating Institute by R. L. Boyd, manager, electrical heating division, Edwin L. Wiegand Co., Pittsburgh, Pa.

CUTS assembly time 26%

**factory-attached, flush coupling Δ no additional cost!*

New **ORANGEBURG®** *CA** **CONDUIT** *with Flush Coupling Attached!*

With no separate couplings to handle or attach on the job, Orangeburg CA lays faster, costs less to install. Each long, light length has a *flush* coupling attached at one end and a standard 2" male taper at the other end, making installation a simple, one-step operation. And, since the coupling is attached, there are no coupling cartons to warehouse or carry to the job.

What's more, with the coupling *flush* to the conduit's outside wall, new CA is easy to stack, store and handle. The flush coupling also eliminates "staggered" joints in the trench. And that means real savings in cutting and tooling time. Like the hundreds of millions of feet of Orangeburg fibre

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New Orangeburg CA is available in 2", 3", 4", 4½" and 5" sizes. Orangeburg Standard and Nocrete Conduit, with separate sleeve couplings, are available as always. Write Dept. EC-49 for Catalog 52.

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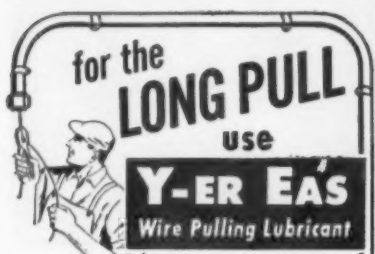


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NISA News

The prediction of a record attendance at the International Convention of NISA, to be held May 17-20 at Montreal's Queen Elizabeth Hotel, is based on the fact that last year's New Orleans Convention attracted a record 1,100 persons (plus several hundred more to the exhibits) and this year's location is near the heavily-populated Eastern industrial areas, according to association officials.

NISA executive vice-president Joseph M. Harrington said another reason for the optimistic outlook was the quick response to his office's announcement about exhibit space. Approximately 50 manufacturers and distributors, in Canada as well as the U. S., will be displaying their wares at the meeting. A few spaces are still available.

The attraction of a Canadian vacation and the prospect of seeing the city that is often called "The Paris of the Mid-West" is another reason for the expected throng, NISA vice president and president-elect H. C. Blenkhorn, of Blenkhorn & Sawle Ltd., St. Catharines, Ontario, said.

This year's convention symbolizes the international character of the National Industrial Service Association and the industry it represents—independent service and sales shops, according to D. D. Bishop, Montreal Armature Works, Montreal, general convention chairman.

One of the biggest NISA regional meetings of the year took place in the South recently. In Brownsville, Texas, Southwestern Chapter held



EXHIBITING the new charter of NISA's Quebec Chapter, presented by national president Paul M. Sievert (left), Sievert Electric Co., Chicago, are H. C. Blenkhorn, NISA vice-president, Blenkhorn & Sawle, Ltd., St. Catharines, Ontario, and Paul Barbeau, Montreal (Quebec) Armature Works, president of the new chapter. Presentation was made at a joint meeting of the Quebec and Ontario chapters in Montreal.



OFFICERS of Heart of America Chapter of NISA were welcomed to Salina, Kansas, site of recent meeting of the organization, by Chamber of Commerce President Charles H. Waeckerle (second from right) and Bill Horton, of Mid-States Armature Works (right). Left is Bill Pickett, Electric Motor Supply Co., Joplin, Mo.; vice-president; and Jim Covert, Covert Electric Machinery Co., Joplin, Mo., president.

its spring meeting March 19-20, followed by a post-convention excursion into Mexico and Monterrey.

Carl Argenbright and Neil R. Chapman recently purchased Johnson Electric Co., Staunton, Va. Mr. Argenbright had been employed by the firm for many years. Mr. Chapman is from St. Petersburg, Fla.

Graham Cox, of Cox & White, Tazewell, Va.; C. C. Canipe, Ivey Weaver's, Inc., Hickory, N. C.; Lamar Hamilton, Hamilton's Electric Motor Service, Brevard, N. C.; and Mozell Payne, Fort Myers Electric Motor Service, Fort Myers, Fla., are new members of South-eastern Chapter.

President Sievert and staff engineer Roe were guest speakers at the March 11 meeting of Quaker City Chapter at Beck's in Philadelphia.

A meeting of Mid-Atlantic Chapter, embracing the Baltimore and Washington areas, was held March 30.

One of the industry's sales authorities, Carl Christensen of Dow Corning Corp., New York City, conducted the program for the New York Metropolitan Chapter February 19 at Hotel Shelburne.

Miller Seldon Electric Co., Detroit, was host to Great Lakes Chapter at a dinner on February 16 in the company's offices. There were 125 present.

Eighteen heard William Dineen and James F. Fenske of Allis-

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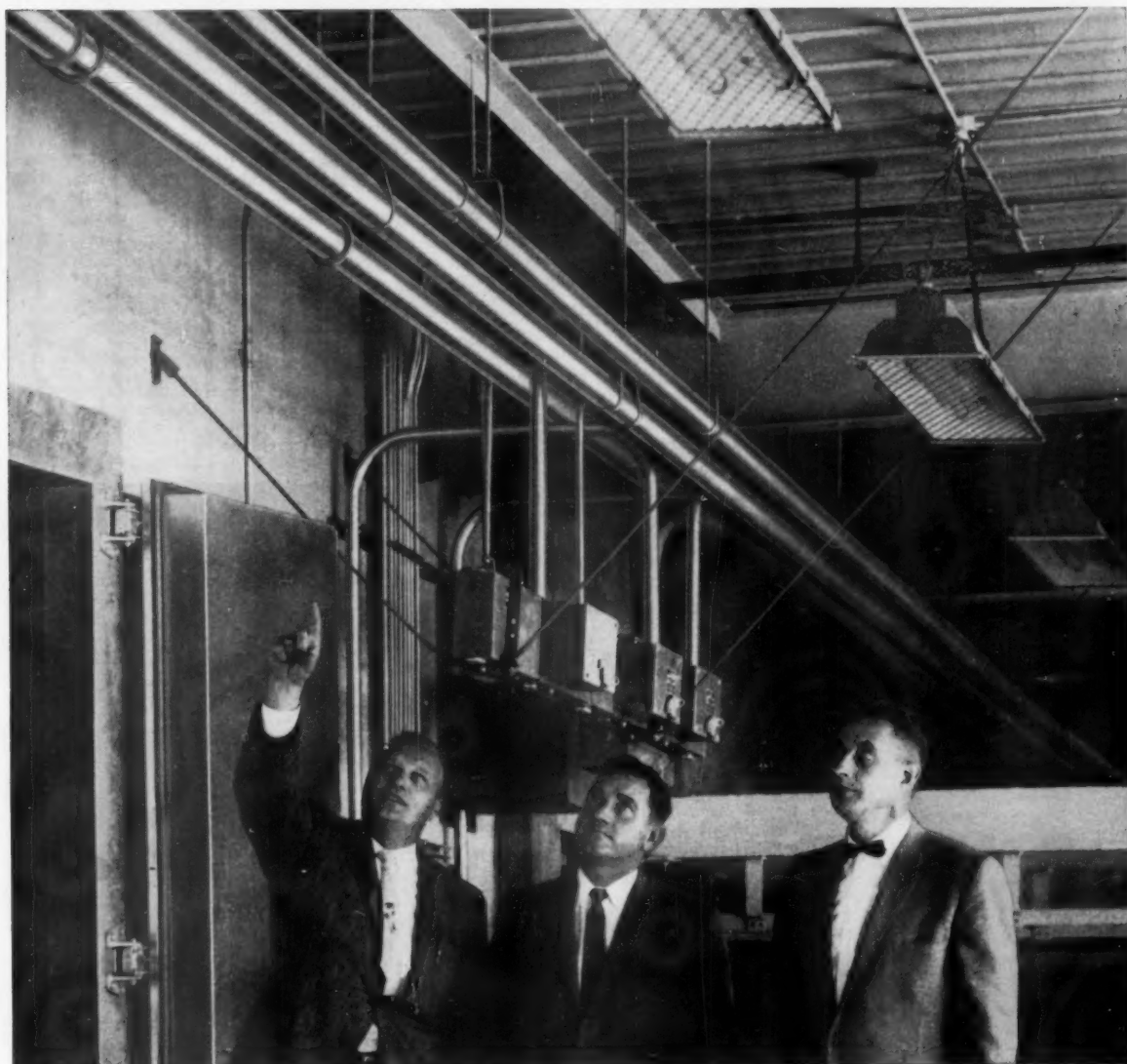
Find out why Alcoa Aluminum is your best conduit buy. Contact your electrical distributor, or write Aluminum Company of America, 2140-D Alcoa Building, Pittsburgh 19, Pennsylvania.

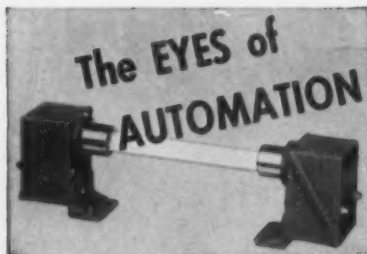
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Chalmers at a meeting of Cincinnati Chapter in Union Terminal on February 4.

Kenneth Vreeland of Cutler-Hammer Co., Milwaukee, Wis. talked about his firm's "Ultraflex 'M' Power Pack" at the March 10 meeting of the Chicago Chapter.

Estimating Manual

Estimating-Accounting Manual for Electrical Contractor-Dealers—designed and published especially for small and average size electrical contractors by the Minnesota Electrical Association, Inc., 525 South Seventh St., Minneapolis 15, Minn. The hinged-cover, 14-ring, loose-leaf binder contains some 200 8½-in. by 11-in. pages; is available on a lease basis. Initial lease fee of \$35 for the first year and renewal fee of \$12.50 includes revision service, additional and replacement sheets as published.

Manual reflects more than 20 years research and business experience of Association contractor members. The subjects covered include: Financial records-accounting; Overhead and business expense; Business forms and billing methods; Credit and collection methods; Contractors liability and insurance; Wage and hour regulations; Sales promotion and advertising; Technical data; Estimating forms and labor unit data. Visible Indexing System permits fast, easy reference to some 95 labor unit tables covering practically every phase of electrical construction work.

Inventory Help Wanted on Outdated Electrical Equipment

An inventory of outdated electrical equipment is under way by the Electrical Historical Foundation. It is tabulating all very old equipment on display, in storage, or still in use throughout the United States and Canada. Museums, utilities, educational institutions and manufacturers are among the organizations from whom information is being solicited.

Information on any old equipment, the older the better, may be addressed to the Foundation, Box 93, Newfane, Vt.

DATES AHEAD

International Association of Electrical Inspectors—Georgia-South Carolina Chapters, Joint meeting, Richmond Hotel, Augusta, Ga., April 12-14; **Alabama Chapter**, Jefferson Davis Hotel, Montgomery, Ala., April 16-17; **Florida Chapter** Sarasota Terrace Hotel, Sarasota, Fla., May 8-9; **Baton Rouge**, George Welman, North Louisiana-East Texas, Texas Gulf Coast Chapters, Five chapter joint meeting, Carlton Hotel, Tyler, Texas, May 15-16; **Northwestern section** Seattle Hotel, Seattle, Wash., August 24-26; **Canadian Section**, Montreal, Quebec, Canada, September 25-26; **Western Section**, Schroeder Hotel, Milwaukee, Wis., October 5-7; **Southern Section**, Heidelberg Hotel, Jackson, Miss., October 12-14; **Mississippi Chapter**, Heidelberg Hotel, Jackson, Miss., October 12-14.

Illuminating Engineering Society—Regional Conferences; **Southeastern and South Central**, Grove Park Inn, Asheville, N. C., April 23-24; **Southwestern** Shamrock-Hilton Hotel, Houston, Texas, May 4-5; **Midwestern**, Pere Marquette Hotel, Peoria, Ill., May 6-8; **Inter-Mountain**, Continental Hotel, Denver, Colo., May 11-12; **Pacific Northwest**, Buffalo Springs Hotel, Banff, Alta., (Canada), May 26-30; **Northeastern**, Curtis Hotel, Lenox, Mass., June 4-5; **Canadian**, Chateauri Laurier, Ottawa, Ont., (Canada), June 11-12; **Great Lakes**, Statler Hotel, Buffalo, N. Y., June 22-23.

National Association of Lighting Maintenance Contractors—Annual conference, Cosmopolitan Hotel, Denver, Colo., April 27-29.

National Industrial Service Assn.—Queen Elizabeth Hotel, Montreal, Canada, May 17-21.

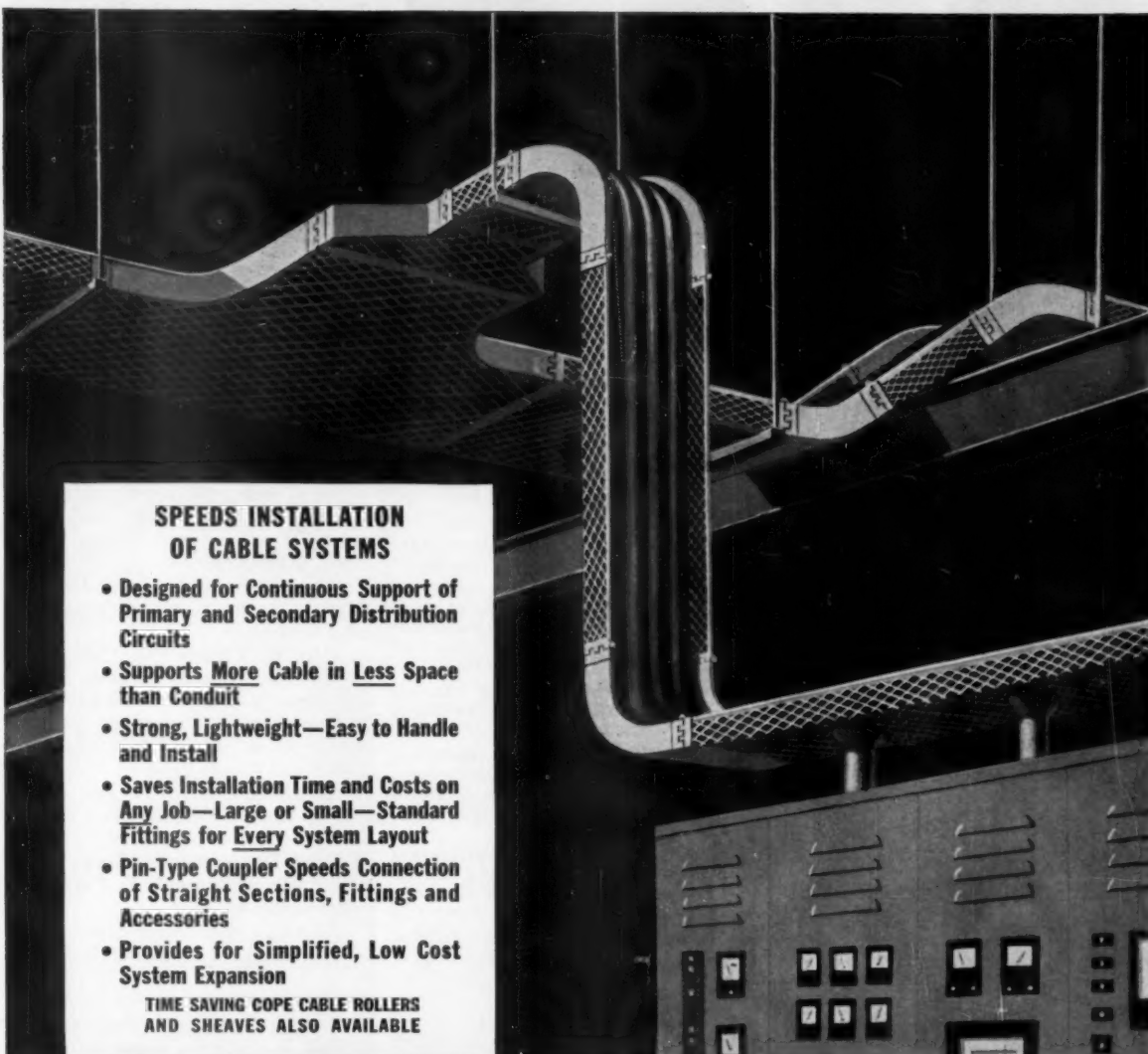
Building Research Institute—Building Illumination Conference, Statler-Hilton Hotel, Cleveland, Ohio, May 20-21.



POLE TOP metering equipment for farm wiring, exhibited at Upper Midwest Electrical Convention in Minneapolis, is examined closely by (L to R) Harry Ricketts, Archie Steenhard and James Green of Ricketts Electric, Iowa Falls, Iowa.

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AT NISA MEETING of Canada's Quebec and Ontario Chapters, from left, Gerry Sauve, J. H. Sauve et Fils, Valleyfield, Quebec; Bill Toll, Toll-Morris Electric, London, Ont.; J. M. Harrington, NISA executive vice-president; Jack Belanger, Electric Motor Sales and Service, Belleville, Ont.

Pacific Coast Electrical Association, Inc.—Annual convention, Fairmont Hotel, San Francisco, Calif., May 20-22.

National Association of Electrical Distributors—51st annual convention, Conrad Hilton Hotel, Chicago, Ill., May 24-29.

National Fire Protection Assn.—Annual meeting, Atlantic City, N. J., May 25-29.

New York State Association of Electrical Contractors and Dealers—60th Annual convention, Whiteface Inn, Lake Placid, N. Y., July 7-10.

Western Electronic Show & Convention—Cow Palace, San Francisco, Calif., August 18-21.

Illuminating Engineering Society—National Technical Conference, Fairmont Hotel and Mark Hopkins, San Francisco, Calif., September 7-11.

Canadian Electrical Manufacturers Assn.—15th annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, September 30, October 2.

11th Biennial Electrical Industrial Exposition—Sponsored by Essex Electrical League; Armory, Elizabeth, N. J., October 10-12.

National Electronics Conference—Sherman Hotel, Chicago, Ill., October 12-14.

Electrical Progress Show—Sponsored by Electrical Association of Philadelphia, Convention Hall, Philadelphia, Pa., October 13-15.

National Electrical Contractors Association—Annual convention and 5th National Electrical Exposition, Fontainebleau, Eden Rock, Deauville and Carillon Hotels, Miami Beach, Fla., November 9-12.

National Electrical Manufacturers Assn.—Annual meeting, Traymore Hotel, Atlantic City, N. J., November 9-13.

Industrial Electric Exposition—Sponsored by Electrical League of Western Pennsylvania, Penn-Sheraton Hotel, Pittsburgh, Pa., November 17-19.

Among the Manufacturers

Headquarters Announcements

John C. Virden Co., Cleveland, Ohio, has acquired the **Lighting Dynamics Div.** of the **Ekco Products Co.**, which will be operated as a subsidiary of Virden.

Circuit Instruments Inc., St. Petersburg, Fla., has merged with **International Resistance Co.**, Philadelphia, and will operate as the **Circuit Instruments Div.**

Precision Transformer Corp., Chicago, Ill.—Victor M. Prybyl, vice president in charge of manufacturing.

Thomas Industries Inc., Louisville, Ky.—Alex McLennan, sales manager, contract division.

Cincinnati Time Recorder Co., Cincinnati, Ohio—Ralph G. Estes, sales manager.

Page Steel & Wire Div., American Chain & Cable Co., Monessen, Pa.—T. P. Bronco, assistant to the general manager, sales activities.

Fairbanks, Morse & Co., Freeport, Ill.—Charles C. Libby, manager, Electrical Div.

Wheel Trueing Tool Co., Detroit, Mich.—H. E. Robison, president and treasurer.

John C. Virden Co., Cleveland, Ohio—Matthew E. Nesta, plant manager in charge of two Lighting Div. plants in Cleveland; Vernon L. Wrye, sales manager, Lighting Div.

Metals & Controls Corp., Attleboro, Mass.—Edward O. Vetter, executive vice president.

Tobe Deutschmann Corp., Norwood, Mass.—Joseph F. Ferrante, vice president.

Amplex Corp., Carle Place, N. Y.—Sy Diamond, advertising and sales promotion manager, industrial and consumer products.

Carrier Corp., Syracuse, N. Y.—Frank E. Purcell, sales manager, Unitary Equipment Div.

Anaconda Wire & Cable Co., New York—C. B. Peck, Jr., and John L. Tindale, commercial vice presidents.

Jefferson Electric Co., Bellwood, Ill.—Dale Campbell, advertising program supervisor; Emmett J. Fallon, Jr., distributor sales manager.

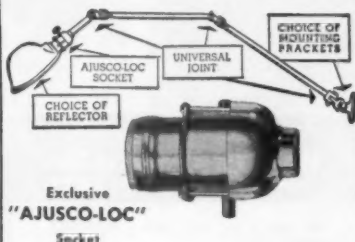
Suflex Corp., Woodside, N. Y.—John H. Goetz, executive assistant.

Cleveland Controls, Inc.—Cleveland, Ohio—Carl A. Wagner, director of marketing and advertising.

Oster Mfg. Co., Wickliffe, Ohio—

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Robert C. Baumgartner, member of the Board of Directors.

Century Electric Co., St. Louis, Mo.—H. George Nafe, manager, headquarters sales staff; Langdon C. Schaefer, manager of engineering.

National Supply Co., Pittsburgh, Pa.—Donald E. Draper, assistant sales manager, conduit and under-floor products.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Joel Hunter, member of the board; Beauchamp E. Smith, vice president.

General Electric Co., Bridgeport, Conn.—J. O. DeVries, general manager, clock and timer department in Ashland, Mass.

Westinghouse Electric Corp., Pittsburgh, Pa.—B. H. Boatner, president, Westinghouse Electric Supply Co.

Progress Mfg. Co., Philadelphia, Pa.—David Weisberg, manager of advertising & sales development.

Regional Appointments

MIDDLE ATLANTIC

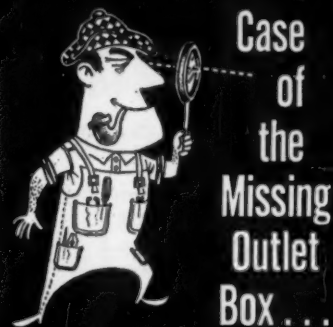
Okonite Co.: Ben T. Bartlett, district manager, Syracuse, N. Y., office.

Electric Auto-Lite Co.: Jerome Sylvan, eastern district representative, Electrical Products Group. International Resistance Co.: J. Burton Henry, regional sales manager, Atlantic region, covering Pennsylvania, west to Ohio, and south to Florida; Ralph B. Dinsmore, New York district sales manager; Evon Wells, Philadelphia district sales manager.

Curtis Lighting, Inc.: H. L. Sykes Co., sales representative for South New Jersey territory.



EAGERLY AWAITING start of electrical heating session at Upper Midwest Electrical Convention in Minneapolis are E. H. Zenker, W. A. Roosevelt Co., LaCross, Wis., and Leo P. Kemp, Winona Electric Construction Co., Winona, Minnesota.

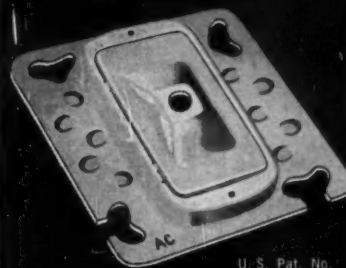


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INSULATION BATS draw attention of electrical contractors Ted Holden (left), Brainerd, Minn.; and R. F. Doering and Richard Rucks (right) of Doering Electric, Clear Lake, Minn. R. J. Black (center), Owens-Corning Fiberglas Corp. tells the insulation story at Upper Midwest Electrical Convention in Minneapolis.

SOUTH ATLANTIC

Allis-Chalmers Mfg. Co.: Bruce C. Halsted, manager, Richmond district.

Carlson Products Corp.: Richard A. Formato, sales manager, Southeastern Div.

Day-Brite Lighting, Inc.: M. Breeden Moore, Jr., sales representative, South Carolina territory.

Curtis Lighting, Inc.: Thomas A. Marshall, sales representative, southern Florida territory.

Feetrail Corp.: Bill Crichton and Associates, representatives in eastern Florida.

Wolverine Tube, Div. of Calumet & Hecla, Inc.: D. R. Frederick, sales representative, Birmingham (Ala.) district, covering north Alabama, middle and west Tennessee, northern Mississippi, and eastern Arkansas.

Anderson Electric Corp.: Gregory-Salisbury & Co., Inc., representative in Louisiana, Arkansas, and parts of Mississippi and Tennessee.

EAST CENTRAL

Fisher-Pierce Co.: K. R. Dodge Co., Cleveland, representative in northern half of Ohio.

Union Metal Mfg. Co.: W. B. Vick, special representative for Lake States and Allegheny Sales Districts to state and municipal governments; C. F. Clark, district manager, Lake States District, covering western Ohio, lower peninsula of Michigan, and Kentucky; M. J. Vitartas, manager of Alle-

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Edwin F. Guth Co.: Fred McRae, lighting representative for southern Ohio, most of Kentucky and southwestern West Virginia.

Murray Mfg. Corp.: Jack Brody, sales representative for Chicago area, including northern Illinois, southern Wisconsin, northwest Indiana and Iowa.

WEST CENTRAL

Century Electric Co.: F. L. Beattie, district manager, Milwaukee office.

Electric Auto-Lite Co.: Norman E. Schmidt, Wisconsin district representative, Electrical Products Group.

Pass & Seymour, Inc.: Jack T. Swafford, sales representative in Oklahoma district covering Oklahoma, northern Arkansas and northern Texas.

John C. Virden Co.: Fred H. Alexander, sales representative in Louisiana, Mississippi and Arkansas.

WEST

International Resistance Co.: Los Angeles sales office has moved from Sylmar, Calif., to Hollywood, Calif.

Union Metal Mfg. Co.: Charles G. Strom, manager, new sales office in San Francisco, Calif.

G. H. Leland, Inc.: Russell L. Moubrey, western regional sales manager covering states west of the Mississippi, plus Chicago area; office in Dayton, Ohio.

International Resistance Co.: John J. Corcoran, regional sales manager, western region; office in Los Angeles.

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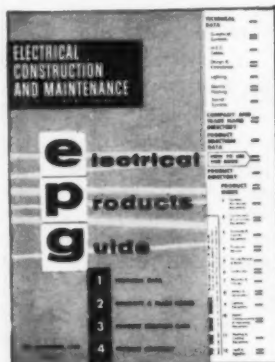
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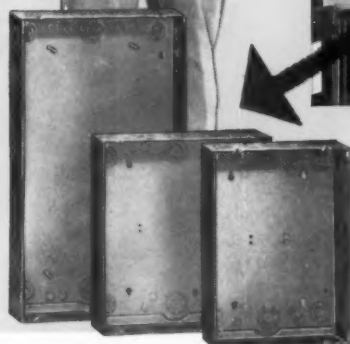
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Plug fuse sections and pullouts plug on to basic interiors, building the service to fit the job. No excess cost.



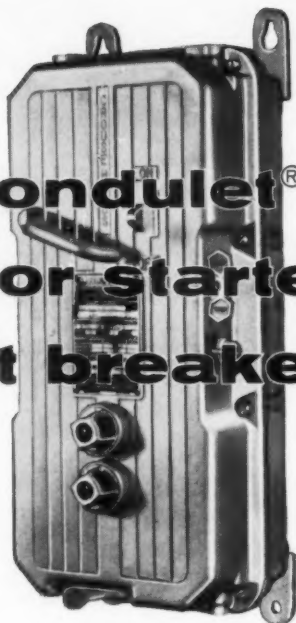
*Write for FSP Bulletin SD-111.
Square D Company, 6060 Rivard
Street, Detroit 11, Michigan*



SQUARE D COMPANY

NOW

a single Condulet® for any
make motor starter
and circuit breaker!



*TYPE DMC: Dust-Ignition-Proof (Dust-Tight) — National Electrical Code Class II, Groups E, F and G; NEMA Type 9EFG.

**TYPE WMC: Watertight — NEMA Types 3, 3R, 4 and 5.

CROUSE-HINDS TYPES DMC* AND WMC** Combination Line Starter CONDULETS

DMC-WMC Condulets are designed to accept and operate any of the various makes of motor starters and circuit breakers. Single speed non-reversing combinations are equipped with a universal mounting plate, motor starter reset assembly and circuit breaker operating assembly. No substitutions of any parts on the Condulets are required.

Built-in push-button stations and selector switches with various contact arrangements, pilot lights and control transformers can be supplied. Push-button and selector-switch operating shaft holes and pilot-light holes may be drilled, tapped and plugged for future use.

Separate mounting lugs are bolted on body. A center position is provided on back of body so that lugs can be attached for 3 point suspension or center pole (2 point) mounting. Circuit breaker handle has provision for padlocking in "On" or "Off" position.

WRITE for descriptive literature and specifications . . .
or contact your Crouse-Hinds distributor.

CROUSE HINDS

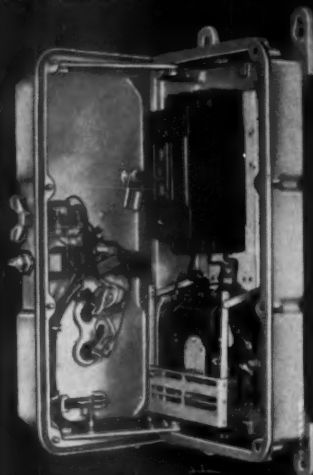
MAIN OFFICE AND FACTORY: SYRACUSE, NEW YORK

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• CONDULET® ELECTRICAL EQUIPMENT (Explosion-Proof and Conventional) • FLOODLIGHTING
• TRAFFIC CONTROL SYSTEMS • AIRPORT LIGHTING and WEATHER MEASURING EQUIPMENT

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UNIQUE COVER HINGING ARRANGEMENT allows DMC-WMC Condulets to be mounted directly adjacent to other Condulets without providing extra space between for cover to hinge open. Cover pulls out, then to either side to clear adjacently-mounted Condulets or other equipment.